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PRESENTED BY

*W. H. Hurlburt*

# ANNUAL REPORT

OF THE

THE CITY OF MONTREAL  
TILLEN FOUNDED 1901

SUPERINTENDENT

*3*  
*1866*

OF THE

# MONTREAL WATER WORKS

FOR THE

YEAR ENDING 31st JANUARY, 1873.

PRINTED BY ORDER OF THE WATER COMMITTEE.



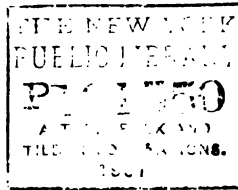
PRINTED BY J. STARKE & CO., ST. FRANCOIS XAVIER STREET.

1873.

DUPLICATE EXCHANGE 2 AUG. 1901



DUPLICATE EXCHANGE 2 AUG. 1901



ROY WEN  
1907  
YEAR

ANNUAL REPORT  
OF THE  
SUPERINTENDENT OF THE MONTREAL  
WATER WORKS,

FOR THE YEAR ENDING THE 31st JANUARY, 1873.

---

*To the Mayor, Aldermen, and Citizens  
of the City of Montreal.*

GENTLEMEN,

In conformity with the order of the  
Council, the following Report is respectfully submitted.  
The line of the

AQUEDUCT

from the Entrance at the Lachine Rapids to the Wheel-House has been maintained during the past year in as good a condition as was possible under present circumstances. A portion of the Canal from the Wheel-House to the St. Pierre Bridge has been cleaned during the summer, to allow of which, the water had to be drawn out of the Aqueduct on three different occasions: on the 21st and the 28th of June, and on the 6th of July last. During that time the supply of water to the City was drawn directly from the Reservoir, and the work of





27	37	35.95	28.40	23.13	19.48	14.87	0.92	7.55	5.27	8.26	22.00	15.36	3.30	21.32	1.01	35.10	34.39	20	
28	37.12	36.15	28.55	23.08	19.33	15.20	0.97	7.60	5.47	7.88	21.92	15.68	3.70	21.32	1.76	35.52	34.30	38	
29	37.12	36.15	28.55	23.08	19.33	15.20	0.97	7.60	5.47	7.88	21.92	15.68	3.70	21.32	1.76	35.52	34.30	38	
30	37.12	36.15	28.55	23.08	19.33	15.20	0.97	7.60	5.47	7.88	21.92	15.68	3.70	21.32	1.76	35.52	34.30	38	
31	37.32	36.40	28.40	21.53	19.48	15.62	0.92	8.00	6.57	5.91	21.70	15.98	3.50	20.92	0.61	35.82	34.17	35	
April																			
1	37.52	36.55	28.40	21.63	19.48	15.62	0.97	8.15	6.77	6.01	21.90	16.08	3.40	20.32	1.31	35.87	40	40	
2	37.67	36.75	28.20	21.93	19.38	15.62	0.92	8.55	6.27	6.31	22.05	16.28	3.10	20.32	1.61	36.00	35	38	
3	38.02	37.05	28.25	22.33	19.08	15.58	0.97	8.80	5.92	6.75	22.44	16.48	2.60	20.00	2.33	36.45	37	38	
4	38.47	37.50	28.60	22.23	18.98	15.58	0.97	8.90	6.37	6.65	22.89	16.78	2.20	20.42	1.81	36.65	40	40	
5	38.82	37.80	28.75	21.28	19.08	15.87	1.02	9.05	7.47	5.41	22.95	16.98	2.10	20.12	1.16	36.78	30	30	
6	38.82	37.80	28.75	21.28	19.08	15.87	1.02	9.05	7.47	5.41	22.95	16.98	2.10	20.12	1.16	36.78	30	30	
7	39.02	38.40	28.70	21.58	19.18	16.04	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	40	37	
8	39.02	38.40	28.70	21.58	19.18	16.04	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	37.03	35	34
9	39.47	38.40	28.85	21.73	19.48	16.29	.....	9.30	7.12	5.46	22.90	16.98	2.20	20.12	1.46	37.17	35	38	
10	39.47	38.40	28.85	21.73	19.48	16.29	.....	9.30	7.12	5.46	22.90	16.98	2.20	20.12	1.46	37.17	35	38	
11	40.07	39.10	28.90	21.88	19.38	16.95	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	37.32	45	45
12	40.07	39.10	28.90	21.88	19.38	16.95	0.97	10.20	7.02	4.43	22.62	18.28	1.10	19.52	2.36	38.42	40	40	
13	40.07	39.10	28.90	21.88	19.38	16.95	0.97	10.20	7.02	4.43	22.62	18.28	1.10	19.52	2.36	38.42	40	40	
14	40.07	39.10	28.90	21.88	19.38	16.95	0.97	10.20	7.02	4.43	22.62	18.28	1.10	19.52	2.36	38.42	40	40	
15	40.22	39.25	28.98	21.63	20.18	21.12	0.97	10.27	7.35	0.51	19.10	21.58	1.40	20.32	1.31	38.92	45	42	
16	40.22	39.25	28.98	21.63	20.18	21.12	0.97	10.27	7.35	0.51	19.10	21.58	1.40	20.32	1.31	38.92	45	42	
17	40.52	39.40	29.18	23.48	19.78	20.87	1.12	10.22	6.70	1.36	18.40	23.78	22.70	78.39	17	40	40	41	
18	40.52	39.40	29.18	23.48	19.78	20.87	1.12	10.22	6.70	1.36	18.40	23.78	22.70	78.39	17	40	40	41	
19	40.82	39.80	29.38	19.82	14.48	17.95	1.02	10.42	9.56	1.87	22.87	17.88	3.40	16.92	2.90	39.55	40	40	
20	40.82	39.80	29.38	19.82	14.48	17.95	1.02	10.42	9.56	1.87	22.87	17.88	3.40	16.92	2.90	39.55	40	40	
21	40.97	39.80	29.43	18.67	14.48	16.37	1.17	10.37	10.76	2.30	24.60	15.68	1.20	14.72	3.95	39.52	35	32	
22	40.97	39.80	29.43	18.67	14.48	16.37	1.17	10.37	10.76	2.30	24.60	15.68	1.20	14.72	3.95	39.52	35	32	
23	40.97	39.80	29.43	18.67	14.48	16.37	1.17	10.37	10.76	2.30	24.60	15.68	1.20	14.72	3.95	39.52	35	32	
24	40.97	39.80	29.43	18.67	14.48	16.37	1.17	10.37	10.76	2.30	24.60	15.68	1.20	14.72	3.95	39.52	35	32	
25	40.97	39.80	29.43	18.67	14.48	16.37	1.17	10.37	10.76	2.30	24.60	15.68	1.20	14.72	3.95	39.52	35	32	
26	40.97	39.80	29.43	18.67	14.48	16.37	1.17	10.37	10.76	2.30	24.60	15.68	1.20	14.72	3.95	39.52	35	32	
27	40.97	39.80	29.43	18.67	14.48	16.37	1.17	10.37	10.76	2.30	24.60	15.68	1.20	14.72	3.95	39.52	35	32	
28	40.97	39.80	29.43	18.67	14.48	16.37	1.17	10.37	10.76	2.30	24.60	15.68	1.20	14.72	3.95	39.52	35	32	
29	40.97	39.80	29.43	18.67	14.48	16.37	1.17	10.37	10.76	2.30	24.60	15.68	1.20	14.72	3.95	39.52	35	32	
30	40.97	39.80	29.43	18.67	14.48	16.37	1.17	10.37	10.76	2.30	24.60	15.68	1.20	14.72	3.95	39.52	35	32	

The above schedule shows also the level of the water of the St. Lawrence below the Lachine Rapids on both sides of the river, and by comparing points opposite each other, it is shown by the levels that the floating ice coming down through both channels at Ile au Héron has the effect of packing the water equally on both sides of the river.

1873.

[illegible]

which indicates that the waters

Lowest	Average Lowest for 5 years.	1867.		1868.		1869.		1870.		1871.		Average Lowest for 5 years.
		Highest	Lowest	Highest	Lowest	Highest	Lowest	Highest	Lowest	Highest	Lowest	
1.06	21.44	26.03	22.04	23.08	19.03	25.01	21.08	25.08	21.08	24.09	23.03	21.25
5.45	<b>36.13</b>	39.40	35.67	37.51	36.34	38.61	36.84	38.70	37.35	38.00	37.35	36.31
10.06	<b>10.66</b>	12.06	11.12	11.01	9.07	12.05	10.09	12.09	11.02	11.07	10.02	<b>10.13</b>
7.08	<b>7.07</b>	9.05	7.10	8.06	7.05	10.01	8.07	10.01	8.08	9.00	7.10	<b>7.48</b>
11.08	<b>11.07</b>	13.03	11.08	13.00	11.01	13.09	12.06	13.05	12.00	13.09	11.03	<b>11.44</b>
11.08	<b>11.66</b>	13.00	12.03	12.01	11.02	12.07	11.08	13.02	12.05	12.06	11.08	<b>11.45</b>
11.09	<b>11.45</b>	19.05	14.03	11.03	9.09	16.01	12.06	.....	.....	.....	.....	3 years <b>11.73</b>
8.11	<b>9.46</b>	11.08	10.08	10.05	9.08	10.02	9.05	.....	.....	.....	.....	3 years <b>9.40</b>
8.03	<b>8.58</b>	9.08	9.00	9.00	8.05	8.08	8.01	.....	.....	.....	.....	3 years <b>8.35</b>
8.07	<b>9.24</b>	11.00	9.03	9.07	8.06	10.00	8.05	.....	.....	.....	.....	3 years <b>8.38</b>
1.00	<b>11.64</b>	13.11	11.08	12.03	10.06	12.00	9.09	.....	.....	.....	.....	3 years <b>10.08</b>
9.04	<b>7.63</b>	11.03	10.05	10.02	9.00	10.00	8.07	.....	.....	.....	.....	3 years <b>9.34</b>
2.08	<b>13.06</b>	14.05	13.10	12.08	11.02	13.04	12.10	.....	.....	.....	.....	3 years <b>12.07</b>
2.06	<b>11.84</b>	13.01	11.06	13.02	11.01	12.10	10.06	.....	.....	.....	.....	<b>10.71</b>
0.02	<b>10.05</b>	12.01	10.06	11.08	10.09	12.00	9.07	.....	.....	.....	.....	<b>9.73</b>



## THICKNESS of Ice on Lachine Canal,

March 28, 1873.

Below Locks at Côte St. Paul.....	2.41
Above " " " " .....	2.50
Opposite Gravel Hill, on Upper Lachine Road.....	2.25
Opposite McCahrey's, on Bank of Canal.....	2.25
" Blue Bonnets.....	2.16

The expenses incurred during the year on the Aqueduct are as follows:—

Repairs to fences, bridges, banks, ditches, &c...	\$680.81
Cutting weeds, &c.....	450.38
Sundries .....	117.60
Keeper's salary .....	566.64
Cleaning Aqueduct .....	2338.70
Covering of Aqueduct.....	3722.13
	<hr/>
	\$7876.26

## WHEEL HOUSE.

The Wheel House and machinery have been maintained in order, and the necessary repairs have been made to the buildings, machinery, and Engineers' dwellings. Some repairs are still required, as can be seen in the Engineer's Report. As usual the Breast Wheels have been idle during the winter season, as will be evident from the Schedule on page 8. As these wheels require a uniform head of water to work with advantage, it is proposed to replace them by Turbine Wheels, which can be worked with a variable head of water, and by placing them low enough, it will be possible to gain an additional fall of seven feet, which cannot be done with the present ones. By this means a great deal more pumping by water can be done in the winter season. With this in view, tenders for the erection of a Turbine Jouval Wheel have been received, and the Committee awaits the sanction of the Council to complete the contract.

SCHEDULE showing the duty of the Two Breast Wheels.

MONTH.	Revolutions Wheel No. 1.	Revolutions Wheel No. 2.	Total No. of Revolutions.	Number of Gallons Pumped.	Olive Oil in Gallons.	Coal Oil in Gallons.	Tallow in Pounds.	Coal for Fuel in Pounds.
1872								
February .....						1.25		7,890
March .....						1.24		1,680
April .....	77,400	116,351	193,451	28,630,748	2.37	2.77		680
May .....	419,502	337,594	757,026	112,039,848	8.33	3.04		
June .....	462,280	178,285	640,565	94,803,620	5.00	3.74		
July .....	505,570	203,835	709,405	104,991,940	5.83	5.30	6.00	
August .....	171,790	347,964	519,754	76,923,592	5.00	4.99		
September .....	45,482	411,217	456,699	67,591,452	5.55	5.30		
October .....	83,093	522,395	605,488	89,612,224	3.92	6.55		
November .....		516,231	516,231	76,402,188	4.44	6.55		
December .....		806	806	132,608	0.58	0.63		7,804
1873								
January .....					0.83	2.49		8,000
Total .....	1,764,817	2,634,608	4,399,515	651,128,220	41.85	43.85	6.00	26,054
Last year .....	1,943,304	3,650,812	5,593,116	827,781,168	47.58	68.13	22.00	34,672

SCHEDULE showing the duty of the Turbine Wheel.

MONTH.	Revolutions.	Number of Gallons Pumped.	Olive Oil in Gallons.	Coal Oil in Gallons.	Tallow in Pounds.	Coal for Fuel in Pounds.
1872						
February .....	114,061	26,576,213	3.85	5.92		8,150
March .....	109,309	25,468,997	3.06	5.61		8,580
April .....	272,524	63,498,092	3.61	3.43		6,510
May .....	488,093	113,725,669	8.88	3.43	16.00	810
June .....	513,143	119,573,969	8.33	4.35		
July .....	533,513	124,308,529	9.15	5.00	10.00	
August .....	540,393	125,911,569	8.61	5.21	5.00	
September .....	419,901	97,836,933	12.26	6.23	28.05	
October .....	495,512	115,454,296	8.61	8.11		
November .....	479,164	111,645,212	8.33	9.49		6,728
December .....	448,067	104,399,611	10.27	13.38	17.00	9,240
1873						
January .....	182,281	42,471,473	3.64	11.63		9,750
Total .....	4,595,961	1,070,870,563	88.96	81.79	76.05	49,768
Last year .....	5,413,640	1,261,378,120	100.25	70.84	113.02	53,664

The expenditure during the year at the Wheel House has been as follows:—

Repairs to Wheel House and Buildings .....	\$310.78
“ Grounds around Buildings.....	186.51
“ Machinery .....	470.85
Fuel .. .....	564.51
Supplies .....	1243.07
Staff's Salary.....	8640.00
	<u>\$6415.72</u>

Quantity of water pumped by the wheels 1,721,998,788 gallons, raised 165 feet high.

Cost per million of gallons.....\$3.72

Cost per million of gallons raised one foot high..... 0.02½

**STATEMENT of the Yearly Expenses incurred at the Wheel-House to run the Water Wheels, and of the amount of Water Pumped into the Reservoir since 1859, and also the Cost per Million Gallons.**

YEAR.	No. of Gallons Pumped.	Expenses without Repairs	Expenses with Repairs.	Cost of Pumping 1 million gallons into the Reservoir.	Cost of Pumping 1 million gallons 1 foot high.
1859 .....	1,140,084,900	\$4,791.92	\$5,438.65	\$4.77	\$0.0289
1860 .....	1,203,042,809	4,406.99	5,885.09	4.89	0.0296
1861 .....	1,287,237,131	4,198.72	4,903.92	3.81	0.0230
1862 .....	1,308,316,960	3,416.09	4,296.37	3.28	0.0198
1863 .....	1,456,253,303	3,373.40	4,357.37	2.99	0.0181
1864 .....	1,488,359,328	.....	3,841.63	2.58	0.0156
1865 .....	1,549,951,743	.....	4,555.08	2.94	0.0178
1866 .....	1,758,348,399	3,548.96	4,786.09	2.72	0.0164
1867 .....	1,987,249,456	5,555.49	7,639.53	3.85	0.0233
1868 .....	1,766,960,500	4,746.63	5,666.36	3.21	0.0194
1869 .....	1,764,081,579	4,665.68	6,960.45	3.94	0.0238
1870 .....	2,022,955,310	4,616.79	5,381.34	2.68	0.0162
1871 .....	2,089,159,288	4,480.29	5,572.36	2.67	0.0161

Average cost of pumping one million gallons into the  
McTavish Reservoir .....\$3.41 } for 13 years.  
Average cost of raising one million gallons one foot  
high ..... 0.02 }



**ENGINE HOUSE.**

The Steam Pumping Engine No. 1 is still in the same condition it was last year, and has been kept at work during the winter, with the exception of a few days for repairs to the crank pin. This Engine was started in September last, and, with the exception of October and part of November, has since been constantly at work.

Engine No. 2, which was finished early in January, 1872, was set to work as soon as completed, but after a few days both valve chests of the pumps gave way, and this Engine was rendered useless for the rest of the winter.

As the cause of the accident was attributed partly to the want of strength of the material in the valve chests, also to the strong recoil of the pump valves, it was thought advisable to modify the form of the valve chests and valves, and to alter the connections of the delivery pipes with the pumping mains, so as to give to each Engine its proper main.

The contractor of Engine No. 2, Mr. E. E. Gilbert, was made responsible for the deficiency in the valve chests by forfeiting a sum of \$250.00, and a new contract was made with him to carry out the proposed improvements to the pump chests and valves for the sum of \$3,950.00, to be completed by the 1st November last. Another contract was also made at the same time with Messrs. W. P. Bartley & Co., for similar alterations to No. 1 Engine. These last contractors were not to disturb their Engine until Engine No. 2 had been completed, so as to leave one of them always in working order; owing to the delay of Mr. Gilbert in fulfilling his contract, and to the early period at which steam power was required, the proposed improvements on No. 1 Engine were deferred till next summer. The two Engines are now at work, and they being at this moment the only

pumping apparatus available to the City, it is therefore of the utmost importance that they should be made as reliable as possible. Besides the alterations to the pump chests and valves of Engine No. 1, I should recommend a new walking-beam with proper centres, so as to permit the alteration to the crank of the fly-wheel, which is too short; another crank and crank shaft, with proper pillow-block, stronger columns to support the main beam and the bracing of the present frame. With these, and the addition of a feed pump to the condenser, this Engine will be made quite reliable.

Summary shewing the Duty of Engines No. 1 and 2.

MONTH.	ENGINE No. 1.		ENGINE No. 2.		Number of Gallons pumped during the month.	Coals consumed for pumping, in pounds	Coals consumed for banking fires, in pounds	Olive Oil, in gallons.	Coal Oil, in gallons.	Number of pounds of coals to raise one million gallons.	Average pressure of Pump Pistons.
	Running Time.	Revolutions.	Running Time.	Revolutions.							
1872.	H. M.		H. M.								No. 1 No. 2
February .....	367.05	357,862	462.03	460,766	81,956,448	944,910	12,540	32.25	47.22	6,575	77 80
March .....	583.25	561,594	204.15	238,918	42,496,344	848,360	12,490	20.81	44.66	6,053	63 75
April .....	540.40	496,207	.....	.....	.....	510,450	1,180	9.17	34.39	5,796	59 ..
September .....	220.25	201,970	.....	.....	.....	223,790	21,900	6.86	6.16	6,825	79 ..
December .....	527.15	475,767	58.30	72,470	12,890,950	687,630	10,340	26.43	18.86	7,158	73 78
1873.											
January .....	466.30	330,355	664.00	651,550	115,891,198	1,359,935	9,600	44.20	31.00	7,462	75
Total .....	2,705.20	2,473,755	1,388.48	1,423,704	253,234,940	4,575,075	68,050	139.72	182.29	6,698	.....

The expenditure during the year at the Engine House has been as follows :—

Repairs to Engine House.....	\$169.01
Repairs to Engines and Boilers.....	690.90
Supplies to Engines.....	1,616.39
Steam coal.....	12,792.71
	<hr/>
	\$15,269.01
Wages of men at Engines.....	4,275.56
	<hr/>
	\$19,544.57
Value of coals on hand... ..	9,302.07
	<hr/>
	\$10,242.50

Quantity of water pumped by steam during the year, 693,241,742 gallons, raised 165 feet high.

Cost per million of gallons..... \$29.05

Cost per million of gallons, raised one foot high.. .17¢

#### BOILER HOUSE.

The tubular boilers, which gave so much trouble during a former winter, have all been repaired, and are now in good working order. As a good deal of the difficulties with which we had to contend was attributed to the want of sufficient boiler capacity, three new Cornish boilers were added to the present ones. The contract for them was awarded to Mr. J. McDougall for the sum of \$17,250, and was to have been completed, and the boilers put in working order, by the 1st of December last.

In consequence, however, of delays on the part of the contractor, the city was exposed for a few days, during the latter end of December last, to another water famine, which might have been very serious had not the interference of the Mayor and of the Water Committee

forced the contractor to push on his work day and night, and to adopt temporary means to enable the Department to make use of these boilers.

On the 1st of January last, one of the boilers was put to work, and the others a few days afterwards. They have been at work ever since, and appear to answer well the purpose for the present, until the contractor is able to complete his work next summer, and replace the temporary steam pipes by the permanent ones.

As part of the present coal shed has been used for the new Boilers, a new shed should be built in front of the Boiler-House of a capacity of 4,000 tons of coal, and so connected with it that the coal could be brought to the Boilers with the least possible expense. During previous winters, and principally during the present one, a good deal of inconvenience has been experienced by the men employed to work the engine, in not having the proper accommodation for them. On account of the isolation of the works from any habitation, it has been difficult to procure for them the comfort which their occupation requires, and has necessitated the employment of a larger number of hands than otherwise would have been necessary. I would therefore recommend the erection of sufficient dwelling accommodation in the vicinity of the works.

Before leaving this subject, I should observe that the magnitude and importance of the works is now such that the permanent staff employed at the Wheel-House is insufficient to cope with it, and requires the appointment of at least one engineer to take charge of the steam pumping apparatus; and for this purpose, I would suggest the appointment of a man thoroughly conversant with the management of steam pumping engines, who should have sufficient control over that portion of the works, so as to relieve the present head engineer of too heavy a responsibility.

## TAIL RACE.

Part of the dam at the mouth of the Tail Race gave way in May last, and has been left in that state ever since. This dam was originally constructed with a view to regulate the tail water in winter, which, previous to the construction of the Tail Race, was allowed to run into the tortuous channels of the river St. Pierre, a stream altogether insufficient for the purpose. The consequence was that, when this river was blocked up with ice, the water could not escape, and was kept back on the Breast Wheels to a depth varying from two to three feet. This difficulty was removed by the construction of the Tail Race; but, as it was urged that unless a continuous flow of water was kept running from the wheels in winter, the new channel would get blocked up as before, the idea of the overflow dam was adopted as a remedy against that contingency, and also with a view of utilizing the fall of water from the wheels to the river, by placing other water wheels at the mouth of the Tail Race, where land was then acquired for that purpose. But, as experience has since demonstrated that the water will escape from the wheels in winter as well as in summer, whether the flow be continuous or not, and that the fall at the river St. Lawrence can be better utilized at the Wheel House by changing the present Breast Wheels for Turbines placed lower, the dam can therefore be dispensed with, and a new outlet made direct to the river by cutting the embankment at the lower end, so as to keep the water of the Tail Race as low as the river will admit.

The rest of the work under this head is in good repair, and the expenses incurred during the year are as follows :

Repairs to banks, bridges, fences, &c .....	\$325.56
Keeper's salary.....	324.05
	<hr/>
	\$649.61

## PIPE TRACK.

The work done on the Pipe Track has been the cleaning of the culvert under the Lachine Canal, the placing of one 24-inch stop valve on the old rising main near the Reservoir, and connecting the new rising main with the 12-inch distributing main at Sherbrooke street.

The valves and pumping mains are all in good order, excepting, however, one of the old twenty-four inch valves at the Wheel-House, which requires renewing.

The expenditure has been as follows :—

Cleaning of culvert under the Lachine Canal...	\$448.12
Cleaning of valves .....	5.75
Repairs to one of the pumping mains in January, 1872.....	645.68
Alteration to pumping main.....	2,317.67
	<hr/>
	\$3,417.22

## RESERVOIRS.

The Reservoir on McTavish street is in the same state as it was last year, very few repairs having been made. Some repairs are required to the Valve House, the railing, the stone walls, and to the keeper's house.

The Coteau Baron Reservoir has not been used but once during last winter, and is in a neglected state of repair.

As this Reservoir is nearly useless as such, and would be an ornament to the city as a public square, I think it would be advisable to plant trees and embellish the ground with a view of opening it to the public.

The expenditure under the head of Reservoirs has been :—

Repairs to railings and buildings .. .. .	\$182.40
Fuel and light .....	108.46
Keeper's salary ... ..	666.66
	<hr/>
	\$957.52

**SCHEDULE** showing the Level of Water and Evaporation at the McTavish Street Reservoir, for the year 1871.

MONTH.	Average Monthly Depth.	Rain Gauges in Inches.				Evaporation in Inches.
		Rain.	Snow.	Reduced to Rain.	Total Rain.	
1872						
February.....	16.77	0.04	19.00	1.20	1.24	1.85
March.....	17.17	.....	31.25	1.38	1.38	2.05
April.....	13.16	0.20	5.00	0.31	0.51	3.75
May.....	21.21	0.38	.....	.....	0.38	4.60
June.....	18.65	0.92	.....	.....	0.92	.....
July.....	15.04	2.53	.....	.....	2.53	4.57
August.....	20.12	1.08	.....	.....	1.08	3.84
September.....	21.51	4.03	.....	.....	4.03	2.68
October.....	21.00	2.75	0.04	.....	2.79	2.71
November.....	21.00	0.92	10.88	1.00	1.92	1.60
December.....	17.65	.....	2.14	2.11	2.11	1.12
1873						
January.....	19.06	0.45	26.50	2.32	2.77	1.56
Total.....						
13.30		13.30	94.81	8.32	21.66	30.33
22.59		22.59	59.00	4.98	27.57	30.00

The following Schedule shows the amount of water used by the City during the year, making an average daily of 6,617,097 gallons; which is 159,517 gallons more than the average of last year.

In this are included 4,888,801 gallons for fire purposes, 24,432,872 gallons for watering the streets, 200,000 gallons for flushing sewers, flooding rinks, &c.

Taking the population supplied with water from the works at 120,000 inhabitants, this would give 55 gallons *per capita*, including the water for manufactures, fountains, and the purposes above mentioned.



**SCHEDULE showing the Average Daily Consumption of Water, in Imperial  
Gallon, for the year 1872, as compared with that of 1871.**

MONTH.	Average 1872.	Average 1871.	Increase.	Decrease.	Total con- sumption for 1872.
<b>1872</b>					
February .....	5,449,747	6,108,120	.....	658,373	172,185,575
March .....	4,900,149	6,485,962	.....	1,585,813	167,856,066
April .....	8,064,601	6,356,588	1,708,013	.....	180,389,179
May .....	7,282,758	6,559,613	723,145	.....	225,765,517
June .....	7,392,330	6,569,112	723,218	.....	214,377,589
July .....	7,643,349	6,814,104	829,245	.....	229,300,469
August .....	6,543,069	7,142,800	.....	599,731	202,835,161
September .....	7,224,962	6,780,880	444,082	.....	201,352,788
October .....	6,615,049	6,547,957	68,092	.....	205,066,520
November .....	6,268,247	6,046,708	220,539	.....	188,047,400
December .....	6,622,527	6,104,279	518,249	.....	202,047,845
<b>1873</b>					
January .....	4,899,757	5,974,840	.....	1,075,083	226,016,415
<b>Total .....</b>	<b>78,906,545</b>	<b>77,490,963</b>	<b>5,234,583</b>	<b>3,919,000</b>	<b>2,415,240,524</b>
D'y Av'ge 1872..	6,617,097			Monthly Av'ge 1872	201,270,044
" " 1871..	6,457,580			" " 1871	196,523,108
<b>Av'ge D'y Inc.</b>	<b>159,517</b>				<b>4,746,936</b>

COMPARATIVE SUMMARY showing the Daily Consumption for each Month, from 1863 to 1872, in the City of Montreal.

Daily Average.	1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.	1871.	1872.
January.....	3,676,755	4,343,153	4,426,068	4,060,503	4,809,262	3,695,329	4,322,122	5,490,715	5,678,174	5,974,840
February.....	3,231,875	3,523,169	2,985,838	2,219,809	5,229,869	2,725,756	2,479,917	4,082,132	6,108,120	5,449,747
March.....	3,087,880	3,332,475	3,760,457	2,562,627	4,827,717	3,717,735	1,671,831	3,428,207	6,485,962	4,900,149
April.....	3,377,615	4,003,223	4,493,937	4,538,395	5,850,820	5,293,004	4,583,000	5,475,387	6,356,588	8,064,601
May.....	4,307,049	3,855,934	3,187,978	4,538,332	5,284,999	4,787,956	4,498,636	5,881,214	6,559,613	7,382,758
June.....	4,479,469	4,025,742	4,928,084	4,708,153	6,036,586	4,966,311	5,147,939	6,397,578	6,569,112	7,392,330
July.....	4,154,671	4,381,352	4,754,354	5,690,600	6,456,322	5,978,677	5,074,155	6,717,105	6,814,104	7,643,349
August.....	4,504,426	4,602,058	5,403,834	5,639,903	6,075,179	5,765,896	5,543,778	6,684,834	7,142,800	6,543,069
September..	4,526,220	4,239,849	4,974,663	5,478,200	5,499,087	5,916,460	5,919,435	6,518,369	6,760,880	7,224,962
October.....	4,055,170	4,323,540	4,531,097	5,460,095	6,680,319	5,586,033	5,695,714	5,837,973	6,547,957	6,615,049
November...	3,529,333	3,728,530	3,449,815	5,625,380	5,112,411	4,262,538	5,131,895	6,117,934	6,046,708	6,268,247
December...	3,624,469	4,213,023	4,332,526	5,624,358	4,718,387	4,511,390	5,156,472	6,012,224	6,104,278	6,622,527
Total.....	47,154,952	48,572,049	51,228,651	56,146,355	65,337,025	57,177,085	55,134,894	68,643,672	77,194,296	79,981,628
Daily average for the year.	3,229,579	4,047,670	4,269,054	4,678,863	5,444,752	4,819,489	4,594,574	5,730,306	6,432,858	6,665,136
Increase....	249,840	118,091	221,384	409,809	663,723	.....	.....	13,508,778	8,550,624	2,787,332
Decrease....	.....	.....	.....	.....	.....	625,263	224,915	.....	.....	.....

## WORK SHOPS.

The work shops are in good order; a new roof was put on the blacksmith's and plumber's shops. The dwelling for the foreman and night watchman is also occupied partly for office purposes, and is quite unsuitable for want of sufficient room; another dwelling convenient to the work has to be rented for the valve man besides.

It would be advisable to acquire some lodgings contiguous to the work shops, to accommodate the families of these employés, and convert the present dwellings into store-rooms in connection with the office, where immediate surveillance over the stores could be better performed by the clerk, than is now the case under the present arrangement. For several years past there has been a good deal of difficulty and inconvenience experienced by the Department in getting work done in the shops of the City, principally in the iron line, such as when repairs are required to any hydrants, stop-valves, or machinery, it is *quasi* a favor to get from the finishing shops or foundries the work done, even after long delays. These difficulties seem to increase every year, as the business of the Department is getting larger. To remedy this, I would recommend the erection at the Wheel-House of a work shop, where water-power could be procured for working the tools. The site could not be better than that I recommended a few years ago, over the sluices of the waste weir, where the walls are already partly built. This would have the effect of keeping the sluice gates under cover in order to prevent the formation of the ice in winter, which renders them nearly useless during that time.

The extra hands which are required during the winter to run the Engines, could be permanently employed in the shops with profit to the Corporation, when otherwise not required to work at the Engines, and any

ordinary repairs to the pumping machinery could also be effectually and promptly attended to, with more economy than is now done.

The same reasons exist for shops in the City, where all the brass work could be made. There is at the present shops sufficient room for such purpose, and the work could be done without taking any more hands, but only taking a better advantage of their idle time, which, for instance, in the case of plumbers, when there is not enough to do to keep them busy in their line, they are often directed to some work which is sometimes a great deal more out of the line of their trade than the melting or the finishing of brass work.

#### PIPE LAYING.

The distribution pipes through the City has been extended to all the new streets and dwellings which require the supply of water, and whenever opportunity has offered itself, larger water mains have continued to be laid in the old streets of the City, with the view to afford a greater protection against fires to the high and costly buildings which are erected every year, and which are filled with large and valuable stocks.

Schedule shewing the pipes laid.

SCHEDULE showing the Pipes, Hydrants, Valves, Services, &c., laid down in the City of Montreal during the year 1872.

NAMES OF STREETS.	LENGTH IN FEET OF CAST-IRON PIPES.					LEAD	NUMBER OF VALVES.						Hydrants.	Brick Chambers.	Houses Supplied.	Length of Lead Pipe in feet.	Weight of Lead Pipe in lbs.	Stop-Cocks.
	LENGTH IN FEET OF CAST-IRON PIPES.						NUMBER OF VALVES.											
	12 in.	10 in.	8 in.	6 in.	4 in.		12 in.	10 in.	8 in.	6 in.	4 in.	Total						
<i>East Ward.</i>																		
Dalhousie Square .....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	24	72	1
Water .....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	58	174	1
St. Paul .....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	16	48	1
Friponne .....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3	68	204	3
Notre Dame .....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	58	174	2
Total .....															8	224	672	8
<i>Centre Ward.</i>																		
St. Gabriel .....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1*	19	57	1
Place d'Armes .....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	21	98	1
Total .....															2	40	155	2
<i>West Ward.</i>																		
Fortification .....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	6	112	336	6
Commissioners .....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	61	285	1†
Foundling .....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	80	240	2
St. Paul .....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3	72	216	3
St. Gabriel .....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	28	84	1
Notre Dame .....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	38	114	1
St. Peter .....	....	....	....	591	....	....	....	....	....	....	....	....	....	....	1	63	489	6
Total .....				591											1	554	1764	20



SCHEDULE showing the Pipes, &amp;c., laid down—(Continued.)

NAMES OF STREETS.	LENGTH IN FEET OF CAST-IRON PIPES.						LEAD	NUMBER OF VALVES.						Hydrants.	Brick Chambers.	Houses Supplied.	Length of Lead Pipe in feet.	Weight of Lead Pipe in lbs.	Stop-Cocks.	Brasses.
	12 in.	10 in.	8 in.	6 in.	4 in.	Total.		12 in.	10 in.	8 in.	6 in.	4 in.	Total.							
<i>St. Ann's Ward.</i>																				
Brought forward..	210	396		105	2654	3365	22	1	2			2	5	1	5	59	1712½	5137½	59	
Barré .....																2	29½	88½	2	
Condé .....							90					1	1		1	25	75	1	1	
Canal .....							173									20	60	1	1	
Queen .....																1	19	57	1	
Farm .....															2	49	147	2	2	
Congregation .....															4	133	399	4	4	
Murray .....															2	46½	139½	2	139½	
Forfar .....															4	102	306	4	4	
Grand Trunk .....															5	115½	346½	5	5	
Total .....	210	396		105	2654	3365	285	1	2			3	6	1	6	81	2252	6756	81	
<i>St. Antoine Ward.</i>																				
St. Bonaventure .....					72	72										14	435½	1306½	14	14
Richmond .....					135	135										12	230½	691½	12	12
Canning .....																3	78½	235½	3	3
St. Margaret .....																4	57	171	4	4
Workman .....																2	90	270	2	2
Albert .....					180	180										14	388	1164	14	14
Victoria .....																7	217	651	7	7
Metcalfe .....																2	78	234	2	2
St. Catherine .....				162		162										10	265	795	10	10
St. Martin .....																5	114	342	5	5
Dorchester .....																2	66	198	2	2

[illegible]

• Inch.



SCHEDULE showing the Pipes, &c., laid down—(Continued.)

NAMES OF STREETS.	LENGTH IN FEET OF CAST-IRON PIPES.						LEAD	NUMBER OF VALVES.						Hydrants.	Brick Chambers.	Houses Supplied.	Length of Lead Pipe in feet.	Weight of Lead Pipe in lbs.	Stop-Cocks.
	12 in.	10 in.	8 in.	6 in.	4 in.	Total.		12 in.	10 in.	8 in.	6 in.	4 in.	Total.						
<i>St. Antoine Ward.</i>																			
Brought forward..				528	2810	3338	97				1	2	3	1	4	207	6411	19425	207
St. Monique .....					528	528						1	1		1	38	114	114	1
Shuter .....		355		8		363										11	297½	892½	11
Richmond Square .....																1	23	69	1
Brucheste .....																1	18	54	1
St. Felix .....																2	42	126	2
Off St. Matthew .....					273	273										4	160	480	4
Versailles .....					225	225						1	1		1	2	31	93	2
St. Genevieve .....																1	12	36	1
Montmorency .....																2	22½	67½	2
Total .....	355			536	3836	4727	97				1	4	5	1	6	232	7055	21357	232
<i>St. Lawrence Ward.</i>																			
Manse .....																6	492	1476	6
Anderson .....																2	28	84	2
Durocher .....																1	33	99	1
St. Urbain .....																3	136	408	3
St. Famille .....				300		300										8	236½	709½	8
St. Charles Borromée .....																3	92	276	3
St. George .....																5	161½	484½	5
Bleury .....																1	40	120	1
Mayor .....																2	48	144	2
Ontario .....				1372	15	1387					1		1	2	3	8	282½	847½	8
Craig .....																1	29	87	1

[illegible]

**SCHEDULE showing the Pipes, &c., laid down—(Continued.)**

NAMES OF STREETS.	LENGTH IN FEET OF CAST-IRON PIPES.					LEAD	NUMBER OF VALVES.					Hydrants.	Brick Chambers.	Houses Supplied.	Length of Lead Pipe in feet.	Weight of Lead Pipe in lbs.	Stop-Cocks.
	12 in.	10 in.	8 in.	6 in.	4 in.		12 in.	10 in.	8 in.	6 in.	4 in.						
<i>St. James Ward.</i>																	
St. Christophe .....	...	...	...	...	...	...	...	...	...	...	...	...	...	1	12	36	1
Champ de Mars .....	...	...	...	...	...	...	...	...	...	...	...	...	...	1	27½	82½	1
Craig .....	...	...	...	...	...	...	...	...	...	...	...	...	...	3	84	252	3
Jacques Cartier .....	...	...	...	...	...	...	...	...	...	...	...	...	...	5	103½	310½	5
Ontario .....	...	...	...	...	...	...	...	...	...	...	...	...	...	15	376	1128	15
St. Denis. ....	...	...	...	...	...	...	...	...	...	...	...	...	...	2	114	342	2
Dubord .....	...	...	...	...	...	...	...	...	...	...	...	...	...	2	90	270	2
St. Hubert. ....	...	...	...	...	724	724	...	...	...	...	1	...	1	5	203½	610½	5
Mignonne .....	...	...	...	...	45	45	...	...	...	...	...	...	...	2	88	264	2
Montcalm .....	...	...	...	...	...	...	...	...	...	...	...	...	1	15	314½	943½	15
St. Catherine .....	...	...	...	...	...	...	...	...	...	...	...	...	...	4	174	522	4
Sherbrooke .....	...	...	...	...	...	...	...	...	...	...	...	...	...	3	166	498	3
Campeau .....	...	...	...	...	...	...	...	...	...	...	...	...	...	1	30	90	1
Rousseau .....	...	...	...	...	...	...	...	...	...	...	...	...	...	1	11	33	1
Beaudry .....	...	...	...	...	...	...	...	...	...	...	...	...	...	17	565½	1696½	17
Wolfe .....	...	...	1393	...	...	1393	...	...	...	2	...	...	2	61	2074½	6223½	61
Amherst .....	...	...	...	...	...	...	...	...	...	...	...	...	...	26	917½	2752½	26
Maple .....	...	...	...	252	...	252	...	...	...	1	...	...	1	3	84	252	3
St. Andre. ....	...	...	...	680	680	680	...	...	...	...	1	...	1	14	432½	1297½	14
<b>Total .....</b>				1645	1449	3094				3	2	5	6	181	5868	17604	181

*St. Mary's Ward.*

St. Mary's Ward.												
Panet .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Craig .....	.....	85	85	.....	.....	.....	.....	.....	.....	.....	.....	.....
Gain .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Visitation .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Papineau Road .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mignonne .....	200	.....	200	.....	.....	.....	.....	.....	.....	.....	.....	.....
Dufresne .....	257	.....	257	.....	.....	.....	.....	.....	.....	.....	.....	.....
Shaw .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
St. Ignace .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Fullum .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
St. Mary .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
St. Catherine .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Dorchester .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lane off Dufresne .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Ontario .....	234	18	252	.....	.....	.....	.....	.....	.....	.....	.....	.....
Susan .....	.....	409	409	.....	.....	.....	.....	.....	.....	.....	.....	.....
Logan .....	639	.....	639	.....	.....	.....	.....	.....	.....	.....	.....	.....
Durham .....	.....	801	801	.....	.....	.....	.....	.....	.....	.....	.....	.....
Paris .....	819	.....	819	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sherbrooke .....	279	.....	279	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lafontaine .....	.....	9	9	.....	.....	.....	.....	.....	.....	.....	.....	.....
Seaton .....	.....	1280	1280	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sydenham .....	.....	811	811	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total .....	1609	4232	5841	.....	.....	.....	.....	.....	.....	.....	.....	.....
Grand Total .....	210	751	12891	2148	382	1	2	.....	.....	.....	.....	.....

**SCHEDULE showing the Pipes, Hydrants, and Valves laid down, and the number of Houses supplied with Water, in the City of Montreal, up to January, 1873.**

WARDS.	LENGTH OF MAIN PIPE IN FEET.										NUMBER OF VALVES.										Hydrants.	Brick Chambers.	Houses Supplied.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
	24 in.	16 in.	12 in.	10 in.	8 in.	6 in.	4 in.	Lead.	Total.	24	16	12	10	8	6	4	2 1/2	Total.	Public	Private																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
																				1				2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
East Centre .....	.....	.....	.....	3270	470	5140	6002	380	16052	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	

The total length of cast iron pipes laid in the city during the year 1872 amounts to 21,486 lineal feet, namely: 210 lineal feet of 12 inch; 751 feet of 10 inch; 7,634 feet of 6 inch 12,891 feet of 4 inch, and 382 feet of 1 inch lead pipe, 1 stop cock of 12 inch, 2 do. of 10 inch, 10 do of 6 inch, and 14 of 4 inch, and 14 fire hydrants.

Also 889 service pipes laid to new houses.

The total length of cast iron pipes laid in the city up to date is: 27,666 feet of 24 inch; 2650 feet of 16 inch, 14,594 feet of 12 inch; 49,878 feet of 10 inch; 7,919 feet of 8 inch; 159,478 feet of 6 inch and 28,056 feet of 4 inch, also 4,023 feet of smaller main pipes, making a total length of 546,277 lineal feet of main pipe or 103.46 miles.

There are now laid 21 stop cocks of 24 inch; 3 of 16 inch, 22 of 12 inch, 48 of 10 inch, 9 of 8 inch, 179 of 6 inch, 424 of 4 inch, and 32 of of  $2\frac{1}{2}$  inch, making a total of 738 stop cocks.

There are 642 fire hydrants, including 33 private ones.

The total number of houses supplied is 16,045.

SCHEDULE showing the Repairs done to Main Pipes, Hydrants and Valves, during the year 1872.

POSITION.	DATE. 1872.	DIA-METER.	VALVES.	HYDRANTS.	BREAKS.	INJURIES.	HOW REPAIRED	PROBABLE CAUSE OF INJURY.
McGill College Av., near Burnside.	Feb. 3	24 in.	1	1	1	1	Put in a new piece.	Split pipe.
McGill College.....	" 7	16 in.	1	1	1	1	" " valve.	Valve worn out.
Philips Square and St. Catherine...	" 13	16 in.	1	1	1	1	" " spindle.	Screw of spindle worn out.
St. Catherine, near Seaton.....	" 16	6 in.	1	1	1	1	" " piece.	Broken across private drain.
St. Helen and Recollet.....	" 20	6 in.	1	1	1	1	" " valve.	Valve worn out.
Fortification and Place d'Armes Hill	Mar. 28	6 in.	1	1	1	1	" " piece.	Broken across main drain.
Dorchester and Cemetery.....	April 1	6 in.	1	1	1	1	" " "	" "
Cemetery and Dorchester.....	" 1	4 in.	1	1	1	1	" " spindle.	Screw of spindle worn out.
Delisle, near Glass Works.....	" 5	4 in.	1	1	1	1	Cut the pipe to thaw it.	Frozen main.
St. Antoine and Cemetery.....	" 6	6 in.	1	1	1	1	Put in a new hydrant.	Old hydrant split by frost.
Commissioners and St. Fran. Xavier	" 6	6 in.	1	1	1	1	" " "	Broken by Shedden's cart.
Lagauchetière and St. Dominique..	" 6	6 in.	1	1	1	1	" " "	Old one worn out.
Ontario and Panet.....	" 6	6 in.	1	1	1	1	" " piece.	Broken pipe.
Delisle Street.....	" 6	6 in.	1	1	1	1	" " "	Cutting the pipe to thaw it. [stone.
Basin and Richmond.....	" 11	6 in.	1	1	1	1	Put in a new valve and bot.	Broken piece cracked and valve out with
St. Catherine and St. Urbain.....	" 17	4 in.	1	1	1	1	" " piece.	Broken by a drain
St. Catherine, near Wolfe.....	" 18	6 in.	1	1	1	1	" " hydrant.	Old hydrant split by frost.
Jacques Cartier Street.....	" 19	4 in.	1	1	1	1	" " piece.	Broken piece, cause unknown.
Claude Street.....	" 22	4 in.	1	1	1	1	" " "	Main pipe burst.

Forfar and Mill	April 24	4 in.	1	Put in a new piece.	Split pipe.
Claude	" 24	4 in.	1	" "	Frozen main—burst.
Mignonne	" 26	6 in.	1	" "	Broken pipe, cause over drain.
St. Maurice	" 26	4 in.	1	" "	Broken by the drain.
Rising Main, N. S. Canal	" 27	24 in.	1	" "	Piece blown out, caused by closing a
St. Bonaventure and Inspector	May 1	1	1	" valve.	Valve worn out. [valve too quickly.
McGill and College	" 2	6 in.	1	" piece.	Broken by settling of earth.
Craig and Sanguinet	" 3	8 in.	1	" "	Broken pipe.
Panet and Logan	" 6	6 in.	1	" "	Broken by a stone laying underneath.
Fortification Lane	" 7	6 in.	1	" "	Broken by the falling on of earth in dig-
Jurons and St. Alexander	" 8	4 in.	1	" spindle.	Split pipe. [ging foundations.
Jurons and Bleury	" 10	4 in.	1	" "	Screw of spindle worn out.
McGill and Notre Dame	" 15	8 in.	1	" "	" "
Canal Bank at McDougall's	" 15	4 in.	1	" piece.	Bad joint in old pipe.
Victoria Square Fountain	" 15	4 in.	1	" valve.	Valve worn out.
Notre Dame and Aqueduct	" 20	4 in.	1	" "	Broken pipe.
Dorchester and Aqueduct	" 20	4 in.	1	" piece.	Valve worn out.
Notre Dame and St. Joseph	" 20	4 in.	1	" spindle.	Screw of spindle worn out.
Versailles and St. Joseph	" 20	4 in.	1	" "	" "
Chaboillez Square	" 20	4 in.	1	" valve.	Valve worn out.
St. George and Craig	" 22	4 in.	1	" "	" "
Sydenham and Logan	" 22	4 in.	1	" "	" "
Sydenham and Logan	" 28	4 in.	1	" "	" "
McGill and St. Joseph	" 29	4 in.	1	" spindle.	Screw of spindle worn out.
Wolfe and St. Catherine	June 4	4 in.	1	" "	" "
St. Joseph and Aqueduct	" 4	6 in.	1	" "	" "
St. Dominique and Sherbrooke	" 7	4 in.	1	" "	" "
Dorchester and Mountain	" 13	6 in.	1	" "	" "
Côté and Craig	" 13	4 in.	1	" valve.	Valve worn out.
Dorchester and Beaver Hall Square	" 18	4 in.	1	" spindle.	Screw of spindle worn out.
Carried over		14 12 17 5			



SCHEDULE showing the Repairs done to Main Pipes, Hydrants and Valves, during the year 1872—(Continued).

POSITION.	DATE. 1872.	DIAMETER.	VALVES.	HYDRANTS.	LEAKS.	HOW REPAIRED.	PROBABLE CAUSE OF INJURY.
Brought forward.....	.....	.....	14	12	17	5	
Napoleon and St. Lawrence.....	June 18	4 in.	1	1	1	Put in a new spindle.	Screw of spindle worn out.
St. Elizabeth and Lagauchetière...	" 19	4 in.	1	1	1	" "	" "
Montreal Rolling Mills.....	" 24	6 in.	1	1	1	" piece.	Split pipe, cause unknown.
William and Duke.....	" 27	.....	.....	.....	.....	" valve.	Valve worn out.
Craig and Radegonde.....	" 27	.....	.....	.....	.....	" "	" "
William, opposite Ann.....	July 6	.....	.....	.....	.....	" "	" "
Jurors and Bleury.....	" 12	.....	.....	.....	.....	" "	" "
William and Duke.....	" 16	.....	.....	.....	.....	" "	" "
St. Mary, opposite Gaol.....	" 18	10 in.	1	1	1	" spindle.	Screw of spindle worn out.
Shaw and Colborne Avenue.....	" 18	4 in.	1	1	1	" "	" "
Jurors and St. Alexander.....	" 24	4 in.	1	1	1	" "	" "
Papineau Road and Dorchester.....	Aug. 3	10 in.	1	1	1	" "	" "
Lagauchetière and German.....	" 6	.....	.....	.....	.....	" piece.	A hole in the pipe, cause unknown.
St. Elizabeth and Mignonne.....	" 9	4 in.	1	1	1	" spindle.	Screw of spindle worn out.
Queen.....	" 17	4 in.	1	1	1	" valve.	Valve worn out.
St. Catherine.....	" 22	4 in.	1	1	1	" piece.	A piece blown out; cause, a flaw in the casting.
St. Peter.....	Sept. 3	4 in.	1	1	1	" valve.	Valve worn out.
Mansfield and Burnside.....	" 5	4 in.	1	1	1	" piece.	Broken by drain.
						" "	Split.

William, opposite Ann	Sept.	13	.....	1	.....	Put in a new valve.	Valve worn out.
Foundling, at Nuns Buildings	"	14	4 in.	.....	"	" " piece.	Broken, cause unknown.
St. Peter	"	14	4 in.	.....	"	"	"
St. Charles Borromée.	"	14	4 in.	.....	"	"	Broken by a drain.
St. Emery and St. Denis	"	15	4 in.	1	"	"	Screw of spindle worn out.
Mansfield and Dorchester	"	15	4 in.	1	"	"	"
Cathcart and University	"	15	.....	1	"	"	Valve worn out.
St. Sacrament, near St. John	"	24	4 in.	.....	"	"	Broken by a drain.
Canning and St. Joseph	Oct.	2	.....	1	"	"	Screw of spindle worn out.
Berri and Craig	"	2	.....	1	"	"	"
City Councillors	"	15	4 in.	.....	"	"	Broken by drain.
Mignonne and St. Chas. Borromée.	"	17	4 in.	.....	"	"	"
St. John, near St. James	"	21	4 in.	.....	"	"	Broken, cause unknown.
Papineau Road and Dorchester	"	22	.....	1	"	"	Screw of spindle worn out.
St. Sacrament and St. Fran. Xavier	"	26	.....	1	"	"	"
Seaton	Nov.	4	4 in.	.....	"	"	Split, cause unknown.
Mill	"	4	6 in.	.....	"	"	Broken by men digging foundation of a building.
Papineau Road	"	19	6 in.	.....	Recaulking the joint.	"	Joint blown out.
St. George	"	19	4 in.	.....	"	"	"
Dorchester, near Amherst	"	19	10 in.	.....	"	"	"
Water and Montcalm	"	19	6 in.	.....	"	"	"
Fulham	"	26	6 in.	.....	Put in a new piece.	"	Broken, cause unknown.
St. Charles Borromée.	"	26	6 in.	.....	Recaulking the joint.	"	Joint blown out.
Wellington, S. S. of R. R. track	"	26	6 in.	.....	"	"	"
Ann, near Wellington	"	27	6 in.	.....	"	"	"
Klug, near Common	"	27	4 in.	.....	"	"	"
Fulham, near Ontario	"	30	4 in.	.....	"	"	"
Notre Dame and St. Francois Xavier	Dec.	3	.....	1	Put in a new valve.	"	Valve worn out.
St. André, near Mignonne	"	3	4 in.	.....	Recaulking the joint.	"	Joint blown out.
Mountain and St. Janvier	"	3	.....	1	Put in a new valve.	"	Valve worn out.
Carried over	.....	27	22	18	6		

SCHEDULE showing the Repairs done to Main Pipes, Hydrants and Valves, during the year 1872—(Continued).

POSITION.	DATE. 1872.	DIAMETER.	VALVES.	HYDRANTS.	BRAKES.	LEAKS.	HOW REPAIRED.	PROBABLE CAUSE OF INJURY.
Brought forward.....	.....	.....	27	22	18	6	.....	.....
Craig and Bleury.....	Dec. 3	.....	.....	1	.....	.....	Put in a new valve.	Valve worn out.
William, near Redmond .....	" 3	.....	.....	1	.....	.....	" "	" "
St. André.....	" 5	4 in.	1	.....	.....	.....	" spindle.	Screw of spindle worn out.
Labelle.....	" 5	4 in.	1	.....	.....	.....	" "	" "
Jurons.....	" 7	4 in.	1	.....	.....	.....	" "	" "
Grey Nun.....	" 7	4 in.	1	.....	.....	.....	" "	" "
Common.....	" 7	6 in.	1	.....	.....	.....	" "	" "
Desrivieres.....	" 12	4 in.	.....	.....	.....	.....	" piece.	Split, cause unknown.
William .....	" 14	.....	.....	1	.....	.....	" valve.	Valve worn out.
St. Lawrence .....	" 16	.....	.....	1	.....	.....	" "	" "
William .....	" 18	.....	.....	1	.....	.....	" "	" "
Capital .....	" 27	3 in.	.....	.....	.....	.....	" piece.	Split, cause unknown.
1873.	.....	.....	.....	.....	.....	.....	.....	.....
St. Francois Xavier and Hospital ..	Jan. 2	.....	.....	1	.....	.....	" one.	Broken, cause unknown.
St. Peter .....	" 8	.....	.....	1	.....	.....	" valve.	Valve worn out.
Basin and Richmond .....	" 9	.....	.....	1	.....	.....	" bottom piece.	Broken by frost.
Dorchester and Sydenham .....	" 20	.....	.....	1	.....	.....	" valve.	Valve worn out.
St. Antoine and Canning.....	" 21	.....	.....	1	.....	.....	" "	" "
Total .....	.....	.....	33	31	18	6	.....	.....

The foregoing schedule shows that there have been 18 breaks and 6 leaks in the main pipes of the city during the year 1872, and 33 stop cocks repaired. 31 fire hydrants have been repaired, of these 5 have been entirely renewed.

Expenses incurred on these items for repairs to mains, service pipes and stop cocks \$1,808.31.

For repairs to fire hydrants and inspection \$2,752.60.

During the winter, 1871 and '72, the frost penetrated into the ground to a greater depth than usual, and the consequence has been that several of the service pipes were found frozen.

These casualties were rendered more frequent by the irregularity of the water supply, which caused the pipes to be left without any pressure of water, which in that state was more apt to freeze than if it had been running. This has caused the Department considerable trouble and expense, in opening up the frozen streets and thawing the ice in the pipes. This year more care has been used in laying the pipes, principally the service pipes, by putting them to the full depth of 6 feet and covering them with wood.

The expenses incurred for repairs to service pipes and supplying water by puncheons have been \$13,392.06.

The following schedule shows the depth to which the frost had penetrated in the several streets which were dug up.

DEPTH of Frost in the Streets of Montreal during the Winter of 1871-72.

DATE	NAME OF STREETS.	Depth in feet and inches under footpath.	Depth in feet and inches under street.	Kind of Pavement.	DESCRIPTION OF SOIL.
1871. Decemr 5	St. Gabriel, near St. Paul .....				
" 18	Notre Dame, opposite Old Shops .....		2 feet. 2 "	Stone. Macadam.	Earth and Gravel. "
1872. January 5	St. Louis, near Gosford .....	3 feet. 3 "		Wood. "	Clay mixed with gravel. "
" 31	St. Louis, No. 54 .....		3 ft. 6 in.	Macadam.	"
February 2	St. Louis, opposite Berri .....	5 "		Wood. Stone.	Pipes laid in old foundations. Gravel and clay.
" 15	Notre Dame, near Dalhousie Square .....		5 feet. 5 "	"	"
	64 Notre Dame .....		5 "	"	"
	26 " .....	6 "	6 "	"	"
	215 " .....		6 ft. 9 in.	"	"
	20 " .....		6 feet.	"	"
	6 " .....		6 "	"	"
	64 " .....		6 "	"	"
	26 " .....		6 ft. 6 in.	"	"
	334 " near St. John .....		6 feet.	"	Clay.
	Notre Dame, near St. Francois Xavier .....		6 "	"	Gravel and clay.
	" corner Jacques Cartier Square .....		6 "	"	"
	64 Notre Dame .....		6 "	"	"
1872. January 9	St. James, at McGibbon's .....		1 ft. 6 in.	Macadam.	Gravel.
	118 and 188 St. James .....		5 feet.	"	Gravel and clay.



Depth of Frost in the Streets of Montreal during the Winter of 1871-72—(Continued).

DATE.	NAME OF STREETS.	Depth in feet and inches under footpath.	Depth in feet and inches under street.	Kind of Pavement.	DESCRIPTION OF SOIL.
1871. Decem <sup>r</sup> 12	Nazareth, at Gardner's Machine Shop. ....		2 ft. 6 in.	Macadam.	Clay.
1872. January 3	Smith, near Kempt. ....		2 feet.	"	"
" 12	Colborne Street, at Griffin's house. ....		2 "	"	"
" 12	Duke and Ottawa. ....		2 "	"	"
" 15	159 College. ....	2 feet.		Wood.	"
" 15	St. Henry, at Evans'. ....	5 "		Macadam.	Gravel and clay.
" 22	St. David, No. 41. ....	2 "		Wood.	Clay.
	Wellington, pork inspection store. ....	5 ft. 9 in.	4 ft. 4 in.		"
	" near Dalhousie. ....		6 feet.		"
	275 William. ....	5 ft. 6 in.		Wood.	"
	125 Magdelen. ....	5 ft. 6 in.	5 ft. 6 in.	Macadam.	"
	10 Eleanor. ....	4 feet.		Wood.	"
	110 King. ....	5 "		"	"
	46 Grey Nun. ....	6 "	6 feet.	Macadam	"
	Chaboillez Square. ....		4 "		"
	Delisle, near Canning. ....		1 ft. 6 in.	"	Gravel.
	" .....		6 feet.	"	"
1872. February 10	30 Coursolles. ....		4 "	"	Gravel and clay.
	27, 31 and 39 Coursolles. ....		4 ft. 6 in.	"	"

February 16	Workman, near Canning .....				Gravel and clay.
	" " main pipe 18 inches under .....				"
	Fulford, near Workman .....				"
	" " corner " .....				"
	" " " " .....				"
" 14	Richmond Square .....	2 feet.		Wood.	Light soil.
" 17	Lusignan, at Holmes' .....			Macadam.	Clay.
	80, 82 and 84 Mountain .....			"	Sand and clay.
	St. Martin, near St. Antoine .....			"	Gravel and clay.
	300 Guy .....			"	"
	St. Antoine and Cemetery .....			"	Clay.
	St. Janvier .....			"	Clay and sand.
1871.	Victoria, near St. Catherine .....			"	Rock.
December 5	Upper Peel .....	4 feet.		Wood.	Sand and clay.
1872.	McGill College Avenue, near St. Catherine .....			Macadam.	Clay.
January 16	91 Aylmer .....			"	"
" 18	Sherbrooke, near Bleury .....	1 foot.		Wood.	"
1871.	" " near McGill College Avenue .....			Macadam.	Clay and sand.
December 28	476 Craig .....			"	Clay.
1872.	12 St. Joseph .....	2 feet.		Plank.	Clay and gravel.
January 24	Dorchester, at Windsor Place .....			Macadam.	Clay.
	255 Dorchester .....			"	"
	" corner Cemetery .....			"	"
	54 Hermine .....			Plank.	Sand and clay.
	Devienne, near St. George .....	3 "		"	Gravel and clay.
	Hermine, near Craig .....	2 ft. 6 in.		Macadam.	Clay.
	Bleury, near Dorchester .....				



DEPTH of Frost in the Streets of Montreal during the Winter of 1871-72—(Continued).

DATE.	NAME OF STREETS.	Depth in feet and inches under footpath.	Depth in feet and inches under street.	Kind of Pavement.	DESCRIPTION OF SOIL.
1872. January 15	St. Urbain, near Craig .....	1 ft. 6 in.		Plank.	Clay.
" 10	Juror, near Bleury.....	2 feet.		"	"
1871. Decem'br 13	St. George, near Jurors.....		2 feet.	Macadam.	"
" 29	St. Charles Borromée, opposite Police Station		2 "	"	"
" 21	German, near Craig .....	1 foot.		"	"
1872. February 8	St. Dominique, near St. Catherine.....	3 feet.		Plank.	Clay and sand.
1871. Decem'br 15	St. André, rear of 186.....	1 foot.			Clay.
" 16	48 Rousseau .....	1 ft. 6 in.			Gravel and sand.
" 20	Lagauchetière and Campeau.....	1 ft. 6 in.	1 ft. 6 in.	Macadam.	Clay.
1872. February 19	" and Panet.....		4 ft. 6 in.	"	"
	75 Lagauchetière.....		5 ft. 3 in.	"	"
	" and St. Dominique .....		5 feet.		"
1871. Decem'br 29	St. Catherine and St. Christophe .....	1 ft. 6 in.	4 ft. 6 in.	"	"
	" near Seaton.....		4 ft. 6 in.	"	"
	" near Panet.....		4 ft. 6 in.	"	"
	303 and 305 St. Catherine .....		5 ft. 9 in.	"	"

1871. February 9	307 St. Catherine.....		6 ft. 6 in.	Macadam.	Clay.
" 10	Fullum and St. Catherine .....	2 feet.	6 feet.	"	"
1871. Decemb'r 14	Seaton, near Mignonne .....	4 "	5 feet.	Plank.	Clay and sand.
1872. February 2	Berri Lane, near Craig .....			"	
	Campeau, at Dumaine's .....				
	St. Mary, nearly opposite the Jail .....	1 ft. 6 in.	2 "	Clay.	Clay.
	154 St. Mary .....	3 feet.		Plank.	"
	566 " .....	5 ft. 6 in.	6 "	Stone.	Clay and gravel.
	St. Mary and Brock .....		5 "	"	"
	Brock and St. Mary .....		5 "	Macadam.	"
	Panet and " .....		6 "	"	
	168 Visitation .....		4 ft. 6 in.	Clay.	
	Longueuil Lane .....		5 ft. 6 in.	"	"
	64 Fullum .....		4 feet.	"	"
	59 Dufresne .....		5 "	"	"
	Blake and Sydenham .....			"	"
1871. February 22	78 Papineau Road .....	3 ft. 6 in.	6 ft. 3 in.	Plank.	Clay and gravel.
" 5	19 Wood Yard .....	5 ft 6 in.		"	Clay.
	94, 96 St. Lawrence .....	5 feet.			Rock.
	644 " .....				

The accidents to service pipes during the winter of 1871 and '72 have been to the number of 1,077, of which the corporation was responsible for 441 and the landlords and tenants for 36.

The causes of these accidents, were as follows: 34 service pipes choked; 991 stopped by frost, and 52 disturbed by other causes.

The following schedule indicates the number of hydrants found frozen during the winter of 1871 and '72, amounting to 221 Hydrants frozen, 437 times, which compared with the previous winter, show an increase of 130 hydrants frozen 128 times.

SCHEDULE showing the Hydrants found frozen during the winter 1871-72.

No. of Hydrants.	No. of Times.
53	1
22	2
19	3
15	4
18	5
5	6
10	7
11	8
5	9
9	10
8	11
5	12
7	13
6	14
6	15
2	16
2	17
2	18
1	19
2	20
5	22
1	23
1	24
1	25
1	27
1	31
2	33
1	42
<hr/>	
221 found frozen	437 times.
During winter 1870-71 91	309
<hr/>	
Increase..... 130	128

**SCHEDULE** showing the number and position of Public Fountains erected  
in the City up to 1873:—

POSITION.	Cast-Iron Basins.	Stone and Cement Basins.	Number of Jets.	Drinking Fountains Stand in Stone.	Drinking Fountains Stand in Iron.	Drinking Fountains Stand in Wood.	Cast-Iron Horse Troughs.
1. St. Mary, at Longueuil Ferry ....	.....	.....	1	.....	.....	1	1
2. Papineau Market .....	.....	.....	1	.....	.....	1	1
3. Papineau and St. Catherine Streets .....	.....	.....	1	.....	.....	1	1
4. Dalhousie Square .....	.....	.....	3	.....	1	.....	1
5. St. Denis, in front of St. James Ch..	.....	.....	1	.....	.....	.....	.....
6. Viger Square, No. 1 Basin.....	.....	3	.....	.....	.....	.....	.....
7. Do. do. No. 2 do. ....	.....	3	1	.....	.....	.....	.....
8. Do. do. ....	.....	.....	2	1	.....	1	.....
9. Bonsecours Market.....	.....	.....	2	.....	.....	2	.....
10. Jacques Cartier Square .....	.....	.....	4	.....	1	.....	1
11. Court House Square .....	2	1	5	2	.....	.....	.....
12. St. Lawrence, at Guilbault's Gard'n .....	.....	.....	1	.....	.....	1	1
13. Place d'Armes Square .....	1	1	5	.....	4	.....	.....
14. Notre Dame & St. Fran. Xavier Sts. ....	.....	.....	1	1	.....	.....	.....
15. Custom House Square.....	2	1	1	.....	.....	.....	.....
16. St. Ann's Market.....	.....	1	2	.....	.....	.....	1
17. Bleury and Dorchester Streets .....	.....	.....	1	1	.....	.....	.....
18. Victoria Square .....	.....	1	9	1	.....	.....	3 stone
19. Craig Street, at Victoria Square.....	.....	.....	1	1	.....	.....	.....
20. Beaver Hall Square .....	.....	.....	2	.....	1	.....	.....
21. Phillips Square .....	.....	.....	2	.....	.....	1	1
22. Grey Nun and Common Streets .....	.....	.....	1	.....	1	1	.....
23. Hay Market .....	.....	.....	2	.....	1	1	1
24. Chaboillez Square .....	.....	.....	2	.....	1	.....	.....
25. Sherbrooke St., near Drummond St. ....	.....	.....	1	.....	.....	1	1 stone
26. Richmond Square .....	.....	2	2	.....	.....	.....	.....
27. St. Antoine Market .....	.....	.....	1	.....	.....	1	1
28. Seigneur and Basin Streets .....	.....	.....	1	.....	.....	1	1
29. McCord and Murray Streets .....	.....	.....	1	.....	.....	1	1
30. Mill Street, at Grant & Hall's Mills. ....	.....	.....	1	.....	.....	1	1
31. Wellington and St. Etienne Streets. ....	.....	.....	2	.....	.....	1	1
32. St. Gabriel Market.....	.....	.....	2	.....	.....	1	1 wood
33. Harbor, Jacques Cartier Basin.....	.....	.....	1	1	.....	.....	.....
34. Do. at King's Basin .....	.....	.....	1	1	.....	.....	.....
35. Do. at Queen's Basin .....	.....	.....	1	1	.....	.....	.....
36. Papineau Road, near City Limits.....	.....	.....	1	.....	.....	1	1
37. St. Denis and Ontario .....	.....	.....	1	.....	.....	1	1
38. Guy and Sherbrooke .....	.....	.....	1	.....	.....	1	1
39. Viger Market .....	.....	.....	3	.....	.....	2	3
40. Dorchester and Visitation .....	.....	.....	1	.....	.....	1	.....
41. Wharf, opp. Quebec Gate Barracks .....	.....	.....	1	.....	.....	1	1
	5	12	85	10	9	24	30

## MANAGEMENT.

STATEMENT showing the various details of the Expenditure on the Montreal Water-Works Department during the Civic Year 1872, ending January, 1873.

## ADMINISTRATION.

## LINE OF AQUEDUCT.

	\$	c.	\$	c.	\$	c.
Paid for Repairs to Bridges and Fences ....	470.	08				
"    Cleaning Ditches and Repairing						
Banks .....	210.	73				
"    Cutting Weeds .....	60.	00				
"    Cutting Ice and Snow .....	390.	38				
"    Setting Derricks .....	17.	60				
"    Allowance for Keeper's Horse .....	100.	00				
"    Keeper's Salary .....	566.	64				
					1815.	43

## WHEEL-HOUSE.

Paid for Repairs to Wheel-House .....	310.	78				
"    Repairs to Engine-House .....	169.	01				
"    Work on Grounds around the						
Buildings .....	186.	51				
"    Repairs to Machinery of Wheels ..	470.	85				
"    Repairs to Engines .....	690.	90				
"    Fuel for Heating .....	564.	51				
"    Supplies in Wheel-House .....	1243.	07				
"    Supplies in Engine-House .....	1616.	39				
"    Men's Wages at Engine .....	4275.	56				
"    Staff's Salary .....	3640.	00				
"    Steam Coal .....	12792.	71			25960.	29

## TAIL RACE.

Paid for Keeper's Salary .....	330.	35				
"    Repairs .....	319.	26			649.	61

## PIPE TRACK.

Paid for Repairs to Pipe under Canal .....	448.	12				
"    Cleaning Valves and Valve Chambers	5.	75				
"    Repairs to Leak on Main .....	645.	68			1099.	55

## RESERVOIR.

Paid for Repairs to Railings and Buildings .	182.	40				
"    Fuel and Light .....	108.	46				
"    Keeper's Salary .....	666.	66			957.	52

Amount carried over .....

30482.40

	\$	c.	\$	c.
Amount brought over.....			30482.	40

## HYDRANTS.

Paid for Repairing .....	908.17	
"    Inspecting .....	1538.86	
"    Thawing .....	168.63	
"    Sundries.....	136.94	
	<u>2752.60</u>	

## PUBLIC FOUNTAINS.

Paid for Men's Wages.....	201.47	
"    Sundries.....	132.10	
	<u>333.57</u>	

## DISTRIBUTION PIPES.

Paid for Repairing Main Pipes .....	948.40	
"    "    Valves .....	859.91	
"    "    Service Pipes .....	2118.12	
"    "    Streets .....	1748.71	
"    "    Footpaths .....	1510.32	
"    Inspecting Services .....	91.80	
"    Watching at Valves.....	853.50	
"    Distributing Water during Water Famine .....	3277.76	
"    Thawing Services.....	3791.85	
	<u>15200.37</u>	

## SHOP DEPARTMENT.

Paid for Men's Wages .....	6287.15	
"    Coals, Iron, &c. ....	1763.71	
"    Repairs to Buildings .....	214.15	
Paid on Annual Instalment .....	800.00	
	<u>9065.01</u>	

## SUPERINTENDENT'S OFFICE.

Paid for Officers' Salaries .....	4477.32	
"    to Turn-Cocks.....	891.47	
"    for Stationery, &c., Printing and Adver- tising .....	737.77	
	<u>6106.56</u>	

## ACCOUNTANT'S OFFICE.

Paid for a Supernumerary Clerk .....	391.80	
"    to Bailiffs .....	1064.00	
"    for Extra Help for Collecting Water Rates.....	520.71	
"    "    Stationery, Advertising, &c .....	403.18	
	<u>2379.69</u>	

Amount carried over.....	66320.20
--------------------------	----------

	\$	c.	\$	c.	\$	c.
Amount brought over .....			66	320.20		
<b>MISCELLANEOUS.</b>						
Paid for Superintendent's Horse Keep .....	409.00					
" Carriage Hire for Committee .....	148.00					
" Contingencies .....	103.00					
" Damages .....	316.50					
" School Taxes and Assessments ....	211.80					
" Horse for Superintendent .....	150.00					
" Sleigh " " .....	59.25					
" Telegraph Instruments .....	396.65					
" Analysing Water .....	105.00					
" Grading Mullin Street .....	210.87					
" Steam and Gas Fitters' Tools for Wheel-House .....	105.25					
			2206.32		68526.52	
<b>PERMANENT WORKS ON LOANS.</b>						
<b>PIPE LAYING.</b>						
Paid for Cast-Iron Pipes .....	14665.62					
" Lead Pipes, Pig Lead and Tin .....	8631.56					
" Valve Stones .....	186.00					
" Stop-Cock Stones .....	64.75					
" Special Castings .....	7109.01					
" Brass Works .....	3248.95					
" Planks .....	385.19					
" Men's Wages .....	13344.94					
" Bricks .....	540.40					
" Cement and Lime .....	192.88					
" Fire Wood .....	40.00					
" Timber .....	302.74					
" Sundries .....	880.88					
			49592.92			
<b>NEW WORKS.</b>						
Paid for Cleaning of Aqueduct .....	2338.70					
" Covering " " .....	3722.13					
" Altering Pumping Main at Engine- House .....	1925.83					
" New Valve at Reservoir, &c., Con- nection in Sherbrooke Street with Pumping Mains .....	391.84					
" Repairs to Steam Pumping Appa- ratus .....	23320.97					
			31699.47			
Amounts carried over .....			81292.39		68526.52	

	\$	c.	\$	c.	\$	c.
Amounts brought over.....			81292.39		68526.52	

## DIVERS.

Paid for Exploration to North River .....	503.56	
" to W. P. Bartley & Co. on Engine No.		
1 (Bonus) .....	8000.00	
" to E. E. Gilbert, Balance of Contract		
on Engine No. 2 .....	8000.00	
" to Saml. Risley, C. E., for Professional		
Services.....	669.25	
" to Laberge & Son for Masonry Work..	65.50	
	<u>17238.31</u>	

## INCREASED SUPPLY.

Paid for Extension of Reservoir.....	4114.92	
"       "       Aqueduct.....	7632.03	
"       Surveys.....	1419.57	
"       Water Meters .....	425.26	
Paid on Account of Water Famine .....	795.50	
"       for Sundries .....	427.55	
	<u>14814.83</u>	
		<u>113345.53</u>
		<u>\$181,872.05</u>

## FUTURE WATER SUPPLY.

The rapid growth of the city has been such that the means now in use for the supply of water are altogether inadequate, and recourse to temporary expedient had to be adopted to keep off the water famine, which, since several winters is threatening to invade the city.

The two steam engines which have been erected for the purpose, have now cost the city nearly \$170,000, and are now hardly sufficient to keep the water supply which is rendered very costly when compared with that furnished by the water wheels. It is of the utmost importance that some prompt measures should be adopted to remedy the difficulty by a large and comprehensive scheme.

For several years past the Water Committee have been engaged in procuring reports and advice from consulting engineers upon several schemes. No definite plan has



yet been finally adopted, but there is hope that this next year the question will be at last settled. A great drawback has been experienced in bringing out large schemes of that nature caused by the instability of committees such as at present constituted, when every year brings new changes in the members composing them, whereby the experience acquired by the old members is often lost by their untimely withdrawal from the civic affairs, and, by the time that the new men replacing them are in a position to carry out the fruit of their labors, their turn has come to make place for others. Two years ago the water committee was as much prepared to carry out their schemes as they are now ; in fact, steps had already been taken to secure part of the land required for the project of a new aqueduct. Since, new or rather old ideas already discarded before, were brought in by new men, and time had to be taken to consider them over again. The idea of bringing water to the city by gravitation from the Laurentides, was revived during the past year ; and, as some new members were anxious to ascertain the practicability of the project, an expedition was organized in company with a consulting engineer to visit the divers localities from where an abundant supply of pure water from the north could be procured at a sufficient elevation to supply all the different levels of the city, and also an analysis of the waters of the several lakes lying north, prepared by the eminent chemist Dr. B. Edwards.

The result of their report has been that this scheme is surrounded with so many obstacles, and would require such an outlay, that it was judged beyond the means of the City to look in that quarter for the water supply.

A survey, with plans and estimates, was also made during the year, with a view of placing the pumping machinery at Lachine Rapids, but the experience of several winters gauging of the water in the river shows that the variation of its levels, from summer to winter, renders this scheme quite problematical and very hazard-

ous. There is now a project prepared with care, and based upon the suggestions of the several eminent consulting Engineers, to bring the water from the same place as the present works, only a little higher up the river.

This scheme, the same as that of two years ago, that of a new Aqueduct coupled with large storage Reservoirs, will be submitted very soon, with plans and estimates, for the approval of your Council.

LOUIS LESAGE,

*Supt. of W. W.*

MONTREAL, 10th March, 1878.

## INVENTORY of Stock on hand, January, 1873.

	36 in.	30 in.	24 in.	16 in.	12 in.	10 in.	8 in.	6 in.	4 in.	3 in.
Cast Iron Pipe in feet.....			180	528	153	4680	1827	1593	2835	.....
Four-Way Branches.....					6	9	4	24	6	.....
Three " ".....					11	14	8	41	23	.....
Sleeves.....		5	14	8	4	13	.....	25	18	4
Taper Pipes.....				1	.....	11	.....	6	.....	.....
Elbows.....								14	5	.....
Double Bends.....								5	.....	.....
Caps.....			1	4	.....	.....	.....	15	27	25
Plugs.....				4	13	4	10	15	2	10
Valves.....			1	1	4	4	4	39	20	.....
Fork Pipes.....	2	.....	.....	.....	2	.....	.....	.....	.....	.....

33 Pieces to raise Hydrants.  
 15 Seats for Hydrants.  
 14 Man-Hole Covers for Hydrants.  
 32 Hydrant Covers.  
 32 Hydrant Frames  
 53 Valve Covers and Plugs.

17 Hydrant Posts.  
 80 Service Plates.  
 32½ Tons of C. I. Pipe, in short pieces  
 29-2 Nozle Hydrants.  
 4-4 " "

## LEAD PIPE AND OTHER LEAD.

9795 lbs. ½ inch Lead Pipe.  
 22101 " 1 " "  
 4211 " Scrap Lead.

1779 lbs Pig Lead.  
 20 " Block Tin.  
 51 " Solder.

## WORK SHOPS ON St. CHARLES BORROMÉE STREET.

## BRASS WORKS.

	DIAMETER.	1½ inch.	1 in. h.	¾ inch.	½ inch.
New Stop-Cocks with Couplings.....	.....	324	932	1	.....
Old " without ".....	19	22	.....	.....	.....
New Elbows with ".....	.....	306	1190	1	.....
Old " without ".....	14	16	4	.....	.....
Single Joints.....	.....	312	671	1	.....
Three-Way Branches.....	.....	12	442	1	.....
American Nozle.....	.....	.....	36	.....	.....
Nose-Nozle.....	3	3	4	.....	.....

23 Brass Spindles.  
 3 Brass Cut-off.  
 1-2 Nozle Hydrants.  
 1 Set Jets d'Eau Fixings.  
 81 Hydrant Washers.

100 Hydrant Nozles.  
 4 Brass Lever Handles and  
 Plates.  
 3 Feet Valves.  
 1000 lbs. Scrap Brass.

Sensors showing the Monthly Average Pressure in the City Mains during the year 1872.

MONTH.	At Water Works Shop, Lagrache-tiere street, corner of St. Charles Borromée Street.	Central Fire Station, Craig Street.	Fire Station No. 2, St. Gabriel Street.	Fire Station No. 3, Wellington Street.	Fire Station No. 4, Chaboullés Square.	Fire Station No. 5, St. Catherine Street.	Fire Station No. 6, Ontario Street.	Fire Station No. 7, Dalhousie Square.	Fire Station No. 8, Craig Street.	Fire Station No. 9, Centre Street.
1872.										
February .....	52.00	60.00	46.00	.....	62.00	30.00	42.00	40.00	55.00	.....
March .....	33.00	35.00	29.00	.....	39.00	30.00	25.00	25.00	43.00	.....
April .....	26.00	33.00	24.00	.....	21.00	34.00	21.00	17.00	27.00	.....
May .....	60.00	64.00	55.00	.....	74.00	.....	49.00	48.00	57.00	.....
June .....	58.00	64.00	56.00	.....	72.00	.....	45.00	45.00	51.00	.....
July .....	55.00	61.00	.....	.....	74.00	40.00	.....	47.00	53.00	.....
August .....	56.00	55.00	.....	.....	50.00	44.00	.....	42.00	64.00	.....
September .....	58.00	54.00	48.00	.....	44.00	43.00	.....	43.00	55.00	.....
October .....	60.00	61.00	52.00	.....	65.00	42.00	.....	55.00	54.00	.....
November .....	60.00	63.00	50.00	.....	67.00	42.00	.....	49.00	.....	.....
December .....	57.00	68.00	47.00	.....	71.00	40.00	.....	51.00	.....	64.00
1873.										
January .....	60.00	71.00	51.00	.....	78.00	41.00	52.00	.....	61.00	68.00

SCHEDULE showing the number of Assessed Dwellings, Stores, Shops, Offices, Warehouses, Manufactories, Hotels, &c., in the City of Montreal, Year 1871-72, with the Assessed Water Rates thereon.

DWELLINGS.

Number Assessed.	Tenanted.	Vacant and not Supplied.	Yearly Rate.	Number Assessed.	Tenanted.	Vacant and not Supplied.	Yearly Rate.
3,049	2,915	134	\$5.00	18,254	17,837	417	
3,197	3,145	52	5.75	39	37	2	28.25
3,054	3,009	45	6.50	7	7	....	29.00
2,318	2,286	32	7.25	96	93	3	29.75
698	690	8	8.00	26	26	....	31.25
1,110	1,086	24	8.75	10	10	....	32.00
326	318	8	9.50	170	163	7	32.75
946	916	30	10.25	18	18	....	34.25
62	59	3	11.00	11	11	....	35.75
754	736	18	11.75	20	19	1	36.50
45	45	....	12.50	8	8	....	37.25
323	318	5	13.25	12	12	....	38.75
181	177	4	14.00	63	60	3	40.25
437	430	7	14.75	1	1	....	43.25
8	8	....	15.50	4	4	....	44.00
257	247	10	16.25	13	13	....	44.75
8	7	1	17.00	48	48	....	47.75
426	413	13	17.75	1	1	....	51.50
5	4	1	18.50	12	12	....	55.25
127	126	1	19.25	3	3	....	59.00
1	1	....	20.00	19	19	....	62.75
283	275	8	20.75	1	1	....	66.50
16	16	....	21.50	1	1	....	70.75
123	123	....	22.25	16	14	2	77.75
10	10	....	23.00	1	1	....	112.75
132	129	3	23.75	1	1	....	115.25
3	3	....	24.50	1	1	....	92.75
239	232	7	25.25	1	1	....	130.25
116	113	3	26.75	1	1	....	144.25
				1	1	....	452.75
18,254	17,837	417		18,859	18,424	435	

SCHEDULE showing the number of Assessed Dwellings, &c—(Continued.)

STORES, SHOPS, OFFICES, &c.

Number Assessed.	Tenanted.	Vacant and not Supplied.	Yearly Rate.	Number Assessed.	Tenanted.	Vacant and not Supplied.	Yearly Rate.
840	777	63	\$4.00	3,516	3,246	270	
391	357	34	5.00	80	77	3	\$34.00
602	553	49	6.00	2	2	....	36.00
155	141	14	7.00	31	31	....	38.00
171	158	13	8.00	1	1	....	39.00
94	92	2	9.00	1	1	....	40.00
315	284	31	10.00	73	71	2	42.00
14	14	....	11.00	1	1	....	45.00
108	97	11	12.00	12	12	....	46.00
21	21	....	13.00	43	42	1	50.00
217	196	21	14.00	1	1	....	53.00
18	18	....	15.00	9	9	....	54.00
39	33	6	16.00	9	9	....	58.00
37	37	....	17.00	1	1	....	60.00
151	145	6	18.00	11	10	1	62.00
3	3	....	19.00	18	18	....	66.00
20	20	....	20.00	6	6	....	70.00
8	8	....	21.00	15	15	....	74.00
123	110	13	22.00	16	15	1	82.00
4	4	....	23.00	2	2	....	98.00
6	6	....	24.00	10	10	....	102.00
6	6	....	25.00	2	2	....	122.00
98	91	7	26.00	5	5	....	130.00
2	2	....	27.00	1	1	....	126.00
11	11	....	28.00	5	4	1	162.00
5	5	....	29.00	1	1	....	282.00
48	48	....	30.00	2	2	....	322.00
9	9	....	32.00	....	....	....	.....
3,516	3,246	270		3,874	3,595	279	

## SCHEDULE showing the number of Assessed Dwellings, &amp;c—(Continued.)

## HOTELS AND TAVERNS.

Number Assessed.	Tenanted.	Vacant.	Yearly Rate.	Number Assessed.	Tenanted.	Vacant.	Yearly Rate.
97	.....	.....	\$12.00	212	.....	.....	\$72.00
21	.....	.....	17.00	2	.....	.....	82.00
43	.....	.....	22.00	2	.....	.....	102.00
12	.....	.....	27.00	4	.....	.....	122.00
7	.....	.....	32.00	1	.....	.....	162.00
10	.....	.....	37.00	1	.....	.....	202.00
8	.....	.....	42.00	1	.....	.....	262.00
2	.....	.....	47.00	1	.....	.....	302.00
7	.....	.....	52.00	1	.....	.....	562.00
5	.....	.....	62.00	1	.....	.....	602.00
212				227			

HORSES.		COWS.		HORSE STALLS.		WATER CLOSETS.		BATHS.	
No.	Rate.	No.	Rate.	No.	Rate.	No.	Rate.	No.	Rate.
1,230	\$3.00	561	\$1.00	775	\$0.50	3,183	\$4.00	1	\$10.00
384	2.00					140	6.00	10	6.00
853	1.50					23	15.00		
2,467						3,346		11	

SCHEDULE showing the number of Assessed Dwellings, &c—(Continued.)

**SPECIAL RATES.**

BAKERIES.		FOUNTAINS.		BREWERIES AND DISTILLERIES		BEER BOTTLEERS.		FACTORIES, &c., &c.		STEAM ENGINES.		
No.	Rate	No.	Rate	No.	Rate.	No.	Rate	No.	Rate.	No.	Pow'r	Total
2	\$5.00	1	\$3.00	1	\$60.00	1	\$10.00	4	\$5.00	3	1	3
1	6.00	13	5.00	1	70.00	5	15.00	1	6.00	3	1½	4½
1	9.00	1	6.00	1	80.00	2	24.00	3	10.00	7	2	14
2	10.00	1	7.00	1	90.00	1	30.00	12	15.00	5	3	15
1	12.00	1	8.00	1	102.00	1	36.00	1	17.00	10	4	40
7	15.00	1	9.00	1	200.00	1	50.00	5	20.00	9	5	45
10	20.00	2	10.00	1	300.00			1	21.00	6	6	36
1	21.00	1	12.00	1	400.00			1	22.50	4	7	28
3	25.00	3	15.00					1	24.00	10	8	80
3	30.00	1	20.00					6	25.00	1	9	9
1	35.00							1	26.00	7	10	70
1	37.50							8	30.00	4	12	48
1	40.00							1	35.00	1	13	13
2	45.00							1	39.00	1	14	14
1	50.00							6	40.00	2	20	40
								1	50.00	1	25	25
								4	60.00	1	40	40
								1	90.00			
								1	150.00			
37		25		8		11		59		75		524½

Grand Trunk R. R. Co., Point St. Charles.....	\$3,250.00
Montreal Jail .....	750.00
Court House .....	600.00
Grand Trunk R. R. Co., Bonaventure Street.....	500.00
Congregation Nuns .....	302.75
Montreal College .....	300.00
City Passenger Railroad Company .....	246.00
Grey Nuns.....	200.00
Hotel Dieu.....	200.00
Montreal General Hospital.....	200.00
Bon Pasteur.....	83.00
City Gas Company, Ottawa Street.....	300.00

There are 17 manufacturing establishments supplied through meters.



## RECAPITULATION.

	Tenanted.	Vacant.	Total.
Dwellings .....	18,424	435	18,859
Stores, Shops, Offices .....	3,595	279	3,874
Hotels and Taverns .....	227		227
	<hr/> 22,246	<hr/> 714	<hr/> 22,960
Engines .....			75
Special charges on manufactories, &c. ....			152
Public Baths .....			11
Horse Stalls .....			775
Water Closets .....			3,346
Horses .....			2,467
Cows .....			561

STATEMENT of Cash Receipts by the Water-Works Department during the  
Civic Year, ending the 31st January, 1872.

Assessed water rates on buildings .....	\$197,474.96
"    "    "    "    Public baths .....	70.00
"    "    "    "    Water closets .....	13,917.00
"    "    "    "    Horses .....	5737.50
"    "    "    "    Cows .....	561.00
"    "    "    "    Horse stalls .....	387.50
From tenants outside the city limits .....	1,975.27
"    Public taps .....	79.73
"    Steam engines supplied through meters .....	603.35
"    Permits for hand hoses .....	119.00
"    "    Building purposes .....	1,760.78
"    Fountains .....	195.00
"    Steam engines charged at tariff rates .....	3,671.50
"    Bakeries .....	530.50
"    Breweries and distilleries .....	1,302.00
"    Sundries .....	1,936.10
	<hr/> \$230,315.19
Less refunded sundry rates twice paid .....	331.37
	<hr/> \$229,983.82
Arrears .....	11,300.20
	<hr/> \$241,284.02
Job Ledger accounts .....	2,095.23
Total .....	<hr/> \$243,379.25

CHAS. LAPIERRE,  
Accountant M. W. W.

**SCHEDULE** showing the number of Assessed Dwellings, Stores, Shops, Offices, Warehouses, Manufactories, Hotels, &c., in the City of Montreal, year 1872-73, with the Assessed Water Rates thereon.

**DWELLINGS.**

Number Assessed.	Tenanted.	Vacant and not Supplied.	Yearly Rate.	Number Assessed.	Tenanted.	Vacant and not Supplied.	Yearly Rate.
3,036	2,862	174	\$5.00	19,809	19,384	425	
3,468	3,414	54	5.75	36	35	1	\$28.25
3,106	3,063	43	6.50	10	10	....	29.00
2,547	2,511	36	7.25	86	85	1	29.75
959	957	2	8.00	2	2	....	30.50
1,187	1,163	24	8.75	24	24	....	31.25
453	453	....	9.50	184	182	2	32.75
1,139	1,114	25	10.25	21	21	....	34.25
71	71	....	11.00	1	1	....	35.00
803	785	18	11.75	16	16	....	35.75
49	49	....	12.50	29	29	....	36.50
368	359	9	13.25	6	6	....	37.25
210	201	9	14.00	8	8	....	38.75
488	486	2	14.75	82	81	1	40.25
14	12	2	15.50	2	2	....	41.75
258	254	4	16.25	2	2	....	43.25
9	9	....	17.00	8	8	....	44.00
506	495	11	17.75	47	47	....	47.75
7	6	1	18.50	15	15	....	55.25
124	123	1	19.25	2	2	....	59.00
6	6	....	20.00	16	15	1	62.75
257	255	2	20.75	1	1	....	66.50
18	18	....	21.50	2	2	....	70.25
185	184	1	22.25	20	19	1	77.75
4	4	....	23.00	10	10	....	92.75
140	140	....	23.75	1	1	....	115.25
268	261	7	25.25	1	1	....	130.25
129	129	....	26.75	1	1	....	452.75
19,809	19,384	425		20,442	20,010	432	

SCHEDULE showing the number of Assessed Dwellings, &c—(Continued.)

STORES, SHOPS, OFFICES, &c.

Number Assessed.	Tenanted.	Vacant and not Supplied.	Yearly Rate.	Number Assessed.	Tenanted.	Vacant and not Supplied.	Yearly Rate.
417	351	66	\$4.00	3,259	3,033	226	
337	317	20	5.00	30	28	2	\$38.00
616	583	33	6.00	2	2	....	40.00
157	145	12	7.00	77	77	....	42.00
173	164	9	8.00	14	14	....	46.00
104	101	3	9.00	43	40	3	50.00
349	323	26	10.00	12	12	....	54.00
18	18	....	11.00	12	12	....	58.00
119	115	4	12.00	1	1	....	60.00
19	16	3	13.00	16	14	2	62.00
217	200	17	14.00	15	15	....	66.00
17	15	2	15.00	4	4	....	70.00
46	40	6	16.00	13	13	....	74.00
32	32	....	17.00	22	22	....	82.00
174	170	4	18.00	1	1	....	90.00
2	1	1	19.00	4	4	....	98.00
20	20	....	20.00	9	9	....	102.00
5	5	....	21.00	1	1	....	110.00
140	130	10	22.00	5	5	....	122.00
4	4	....	23.00	3	3	....	130.00
11	10	1	24.00	2	2	....	132.00
4	4	....	25.00	2	2	....	142.00
122	116	6	26.00	1	1	....	146.00
13	13	....	28.00	5	4	1	162.00
2	2	....	29.00	1	1	....	202.00
49	48	1	30.00	1	1	....	242.00
1	1	....	31.00	2	2	....	322.00
12	10	2	32.00	2	2	....	362.00
78	78	....	34.00	....	....	....	
1	1	....	36.00	....	....	....	
3,259	3,033	226		3,559	3,325	234	

SCHEDULE showing the number of Assessed Dwellings, &c—(Continued.)

HOTELS AND TAVERNS.

Number Assessed.	Yearly Rate.	Number Assessed.	Yearly Rate.	Number Assessed.	Yearly Rate.
124	\$12.00	234		255	
23	17.00	1	\$47.00	2	\$142.00
45	22.00	9	52.00	1	162.00
22	27.00	5	62.00	1	252.00
4	32.00	1	72.00	1	302.00
8	37.00	2	82.00	1	532.00
8	42.00	3	102.00	1	552.00
234		255		262	

HORSES.		COWS.		HORSE STALLS.		WATER CLOSETS.		PUBLIC BATHS.	
No.	Rate.	No.	Rate.	No.	Rate.	No.	Rate.	No.	Rate.
1,221	\$3.00	576	\$1.00	746	\$0.50	3,512	\$4.00	1	\$10.00
457	2.00					179	6.00		
981	1.50					54	15.00		
2,659		576		746		3,745		1	

SCHEDULE showing the number of Assessed Dwellings, &c—(Continued.)

SPECIAL RATES.

BAKERS.		BEER BOTTLERS.		BREWERS.		FOUNTAINS.		FACTORIES.		STEAM ENGINES.			SUNDRIES.	
No.	Rate.	No.	Rate.	No.	Rate.	No.	Rate.	No.	Rate.	No.	Horse Power.	Total.	No.	Rate.
1	\$2.00	1	\$3.00	1	\$60.00	1	\$3.00	8	\$10.00	4	1	4	4	\$5.00
1	5.00	1	5.00	1	70.00	14	5.00	4	15.00	1	1½	1½	1	6.00
3	6.00	1	6.00	1	80.00	1	6.00	2	20.00	15	2	30	2	15.00
2	9.00	1	10.00	1	90.00	1	7.50	1	22.50	12	3	36	1	17.00
4	10.00	1	12.00	1	300.00	1	8.00	4	25.00	15	4	60	1	20.00
1	12.00	1	14.00	1	400.00	1	9.00	6	30.00	10	5	50	1	25.00
4	15.00	3	15.00			2	10.00	5	40.00	18	6	108	1	26.00
10	20.00	1	24.00			1	12.00	1	54.00	2	7	14	2	30.00
1	21.00	1	30.00			1	15.00	3	60.00	13	8	104	1	40.00
2	25.00	1	50.00					1	90.00	2	9	18	1	42.00
3	30.00							1	150.00	8	10	80	1	50.00
1	35.00									3	12	36	1	60.00
1	37.50									1	14	14	1	
2	40.00									1	15	15		
2	45.00									3	20	60		
2	50.00									1	40	40		
40		12		6		24		36		109		670½	17	

## SPECIAL RATES—(Continued.)

Grand Trunk Railway Company, Point St. Charles.....	\$3,250.00
Montreal Jail.....	750.00
Court House .....	600.00
Grand Trunk Railway Company, Bonaventure Street.....	500.00
Montreal College.....	400.00
Congregational Nunnery.....	302.75
Gas Works, Ottawa Street .....	300.00
Grey Nunnery.....	250.00
City Passenger Railway Company.....	246.00
Hotel Dieu.....	200.00
Montreal General Hospital.....	200.00
Bon Pasteur.....	83.00

There are 25 manufacturing establishments supplied through meters.

## RECAPITULATION.

	Tenanted.	Vacant.	Total.
Dwellings .....	20,010	432	20,442
Stores, Shops, Offices.....	3,325	234	3,559
Hotels and Taverns.....	262	—	262
	<u>23,597</u>	<u>666</u>	<u>24,263</u>
Engines .....			109
Special charges on manufactories, &c.....			147
Public Baths .....			1
Horse Stalls.....			746
Water Closets.....			3,745
Horses.....			2,659
Cows .....			576

## STATEMENT of Cash Receipts by the Water Works Department during the Civic Year, ending the 31st January, 1873.

Assessed water rates on buildings.....	\$215,381.56
“ “ “ “ Water closets.....	15,932.00
“ “ “ “ Horses .....	6,048.50
“ “ “ “ Cows .....	576.00
“ “ “ “ Horse stalls.....	373.00
Carried forward .....	<u>\$238,311.06</u>

Brought forward .....	\$238,311.06	
From tenants outside the city limits .....	2,331.82	
" Public taps .....	110.50	
" Steam engines supplied through meters .....	1,088.50	
" Permits for hoses to water streets, &c. ....	138.00	
" Permits for building purposes .....	1,968.51	
" Private fountains .....	165.50	
" Steam engines charged at tariff rates .....	4,693.50	
" Bakeries .....	858.50	
" Breweries .....	1,000.00	
" Sundries .....	3,397.95	
	<u>\$254,063.84</u>	
Arrears .....	10,414.24	
	<u>\$264,478.08</u>	
Less refunded by order of Committee .....	304.50	
	<u>\$264,173.58</u>	
Job Ledger accounts .....	1,197.07	
	<u>\$265,370.65</u>	
Water rates collected in 1872 .....	\$264,173.58	
Water rates collected in 1871 .....	241,284.02	
	<u>\$22,889.56</u>	

CHAS. LAPIERRE,  
*Accountant M. W. W.*

REPORT  
OF THE  
ENGINEER AT THE WHEEL HOUSE.

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TO LOUIS LESAGE, ESQ.,  
*Superintendent of Montreal Water-Works.*

DEAR SIR,

My Annual Report for the year ending 31st December, 1872, is respectfully presented, showing the state of the pumping machinery and buildings, the repairs, alterations and improvements effected during the past year, with such suggestions as I deem necessary to insure an abundant and permanent water supply during the incoming year, an approximation of the necessary supplies, also the amount of labor required for the efficient management and maintainance of my Department.

SETTLING POND.

The portion of the stone lining and centre pier which had fallen in above the waste weir, and which was in danger of being forced into the Gates, was rebuilt last summer; also, the removal of a large amount of the sediment which had collected in front of the flumes and inlet pipe of the Steam Engines, and it is advisable, during next summer, to clean away as far as possible the remainder, more particularly in front of the inlet pipes, and adopt some means to prevent, as far as possible, all further collection in front of said pipes.



**TAIL RACE.**

Some time about the first of June last the east end of the dam gave way, directing the water with great force against the opposite bank, washing away a large piece of land. The best way to prevent further damage is to cut through the bank at the foot of the Tail Race, and allow the water to discharge on a straight line into the river. Moreover, that the new Turbine, which is to replace one of the Breast Wheels, may have the advantage of the greatest possible head, it will be necessary to lower the water in the Tail Race to the level of the Wheel pit. On account of the dam giving way, it becomes necessary to trap the three arches of the Wheel pits to prevent the frost entering the buildings. This was effected in a temporary manner last October, and will require to be made in a more substantial way next summer.

**BREAST WHEELS.**

The only repairs required by the Breast Wheels during the past year was two plungers, buckets, spindles, and a sett of new bolts for the valves chest and pump covers. Pump barrels of No. 1 Wheel are slightly loose, and must be made secure at an early date. There are also some slight repairs to be done on the air pump.

The bulk-heads of the Breast Wheels are considerably decayed, and require slight repairs.

The Breast Wheels, Cranks, &c., received a coat of paint last May, and, excepting the loose pump, they are in good working order.

**TURBINE AND PUMPS.**

The only repairs done to the Turbine and its machinery during the past year, was a sett of new studs in one of the pistons, and adjusting the cross-heads several times. The whole of this machinery received

a coat of paint last spring. The repairs which I deem necessary to be carried out on this part of the Works during the summer, is to duplicate the Bevel Mortice Wheel, and have it cogged and ready to replace the present one, the cogs of which, in my opinion, will not last another year. The cogs of the Spur Wheel are much worn, and, although they might run another year, yet I cannot be responsible for them. The Cross-Heads, which I have condemned on several occasions with a view of having them replaced by more suitable ones, have been a great source of annoyance and trouble from the first, and, apart from their injurious effects on the pumps, pistons, rods and stuffing-boxes, they are a disgrace to the Works; wherefore, I expect at an early date to be instructed to prepare drawings for others on a better principle. The damaged valve-chest, although leaking, is to all appearances quite strong enough to retain its place without the least risk. Excepting the above recommendations, this part of the Works is in capital working order.

#### STEAM PUMPING ENGINE NO. 1.

The only repairs done to No. 1 Steam Pumping Engine during the past year, was re-making the lower joint between the steam-jacket and low pressure cylinder, which was leaking very bad, and was made perfectly steam-tight by running a quantity of lead between the jacket and cylinder; putting in three crank pins; replacing one of the pump valve faces of No. 1 Engine, which on two occasions became detached; regrinding the throttle valves, and placing two girders under the bracket of the main pillow block, which had the effect of making it much stronger. The new valve chests, &c., intended to replace the present ones, owing to the shortness of time, were not placed in position, but will during the coming summer. At the same time I would recommend

that this Engine be improved according to drawings prepared last May ; and if carried out, I have no hesitation in saying that it may be relied on with confidence.

#### STEAM PUMPING ENGINE NO. 2.

Steam pumping Engine No. 2 started for the first time on January 4th, 1872, and worked up to the 11th of March, on which date, owing to the lightness of the pump, valve chests, and the necessity of working both Engines on one main, both valve chests burst, and were replaced last fall by others on a different principle, and are giving entire satisfaction. During the month of November last, the two rising mains were, by the addition of two fork pipes, two 24-inch valve pipes, &c., altered in such a way as to render the two Engines independent of each other. The two stop valves are connected in such a way that they are both operated on at the same time by the Engineer, altogether doing away with the unsteady working and sudden stoppages to which the Engine was subject to last year. The vertical pipe in the air vessel worked loose three times during the past year, and will require overhauling next summer. The holding-down girders under the waste pump are loose in the foundation walls, allowing the pump to work slightly vertical at each stroke, and must be made permanently secure during the coming summer ; also, one of the steam pistons, which at times makes considerable noise, will require to be examined and the defect remedied. The injection valve, at present regulated by a screw, is very unsatisfactory, and I would recommend that the said screw be replaced by a lever. The non-conducting cement with which the steam pipes were covered, is all falling off, and I would recommend that the said pipes be recovered with felt and wood laying, held on by brass hoops. In every other respect the Engine is in good condition.

**BOILERS.**

During last spring, in consequence of the too limited boiler capacity, aggravated by the large amount of sediment in the feed water which was supplied from the inlet pipes, the battery of six old boilers was worked with very much risk to life and property, notwithstanding the extremely close attention given them by myself and assistants. The portions immediately over the fires very frequently became over-heated, and bulged down, and in some cases the sheets were cracked, and were kept at work only by almost constant repairing. Last summer the damaged portion of four of these boilers was cut out, and suitable plates riveted on; and apart from the tear and wear of four years, they are nearly as good as ever. In view of the above unsatisfactory state of affairs, I took occasion last spring to recommend six more boilers of a larger size. Happily, but not a moment too soon, three were delivered, and in the latter part of December and beginning of January, temporarily connected to the Engines. Next summer, when the work is being carried out according to plans and specifications, it will be necessary to take down all the steam pipes on the old boilers, and re-make all the joints. The injection water, a portion of which supplies the boilers, was previous to this year taken from the inlet pipe, and contained a very large amount of sediment. To remedy this evil, a six-inch pipe, of sufficient length to extend about 40 feet in the Settling Pond, was laid in the inlet pipe of the Engines.

**BUILDINGS.**

The windows and doors of the Breast Wheel and Turbine house, were repainted last May; also, the galleries and stairs of the latter. The Breast Wheel house is in good repair, excepting the ceiling, which is considerably soiled, and requires a coat of paint. The

ground floor and beams of the Turbine house are so much decayed, that they will require to be renewed next summer. A new stairs is required at the north end of the Turbine house. Considering the number of times that it became necessary to disfigure the interior of the Engine-House in order to effect certain repairs and alterations to the Engines, this building is, with the exception of the ceiling, in fair condition. I beg to call your attention to the great importance of having a gallery erected around the interior of the Engine-House, by which access may be had to the upper windows ; also, a gallery around the top of No. 1 Engine, and one or two bridges to connect the galleries of both Engines and main gallery of the buildings. If this were done, it would set off very much the appearance of the buildings and Engines, besides the great convenience which would be experienced in attending the machinery.

#### BOILER HOUSE AND COAL SHED.

The only repairs required by those buildings are, re-glazing some of the windows, and repairing the north-west corner of the coal shed. Those windows and the glass door of the Pump Room are continually getting broken. I would recommend that they be covered with strong wire gauze.

#### EMPLOYÉS.

The permanent staff attached to my Department, before and since the erection of the two Engines, has been four, viz., two Assistant Engineers and two oilers. During low water, when the Engines are at work, it will be necessary to employ the following additional labor, viz., one engineer, two oilers, two cleaners, nine firemen, six coal passers, and two coal weighers ; and unless the coal shed is made of sufficient capacity to

contain the necessary amount of coal to work the Engines during winter, the additional labor of four men and two horses will be required to convey coal from the yard to the present weighing shed.

#### DWELLINGS.

Excepting that the doors, windows and surbase require repainting, they are in good condition; the store and coal sheds are also in good order. The subject which has the greatest claim on the most serious consideration of the Water Committee and yourself, is the fact that the requirement of the city in water supply is nearly, and I believe next year will be fully, up to the full pumping capacity of the Engines; and should an accident occur to one or both of these Engines, which sometimes occurs to the best machinery, and nothing to fall back on, the consequences would be easier imagined than described. Moreover, it has become necessary to work the Engines so constantly, that there is no opportunity of overhauling or doing any repairs to the said Engines during their working season. Another subject which claims your attention, is the necessity of a suitable store-house for the reception of all the supplies required for the establishment; all the stores to be under lock, and accessible to only one person, whose duty it will be to receive, weigh out, and give a correct return of the same. If this is carried out, it will conduce much to cleanliness and economy. It is to be hoped that henceforward there will be some other place of deposit for the ashes, which is borne on the wind throughout all the buildings, the dwellings not excepted. By this time you will have perceived that the number of permanent hands employed is altogether inadequate to the requirements of the Works. When the Engines are stopped in the spring, there will be a large amount of work to be performed, in taking down, overhauling, and getting ready for next

winter. Therefore, I recommend that another engineer and two firemen be added to the permanent staff, and their time can be most profitably employed.

The whole is most respectfully submitted.

I have the honor to be,

Sir,

Your most humble and obedient servant,

THOMAS WALSH,

*Engineer.*

*Wheel-House,*

March 1st, 1873.

## APPENDIX.

### *Estimate of the probable cost of placing the Water-Wheels and Pumps of the Montreal Water-Works at the Lachine Rapids.*

#### DESCRIPTION.

The site chosen as the most advantageous for the fall of water-power, is a point about 1,800 feet below Knox's old mill, such as indicated on the accompanying plan. The estimates are based upon an assumed fall of seven feet as being that which may likely be most available during the winter months.

NOTE.—Since the above report has been made, gauges were established at four points along the route of the proposed dam, and the levels of the water were taken daily at all these stations during the winter months of 1872, and the result shows for January an average fall of . . . . . 3.46 feet.

February . . . . . 3.73 "

March . . . . . 5.30 "

April . . . . . 6.77 "

The work consists of making a dam of crib-work out in the stream and parallel to the shore, at a distance from it of 200 feet for Estimate No. 1, and of 350 feet for Estimate No. 2; the length of this dam to be about 2,150 feet, built of two parallel cribs, each of 15 feet width on top, with a space between them of 7 feet wide for puddle; one side of each crib to be perpendicular, and the other to have a bottom of one foot horizontal for four feet vertical.

The Pumping Machinery to consist of Turbine Wheels and Pumps placed in suitable buildings. The Pumping Mains to start from the Wheel-House, and to connect to a proposed reservoir on Côte St. Antoine road, with their proper valves, connections, &c., as shown on the plan.



Estimate No. 1 of the probable cost of works of the capacity of the present Works; that is, sufficient to pump 12 millions of gallons in 24 hours into the Reservoir of McTavish Street :—

Crib Work 39,178 cubic yards at \$2.15.....	\$84,232.70
Puddle Work 8,874 " " " 50 cents....	4,187.00
	<hr/>
	\$88,419.70

#### MACHINERY AND BUILDINGS.

Three Turbine Wheels, with pumps and connections, each complete.....	120,000.00
Wheel-House to contain do., with flumes, head-gates, connections, &c. ....	90,000.00
	<hr/>
	\$210,000.00

#### PUMPING MAIN TO PROPOSED RESERVOIR ON CÔTE ST. ANTOINE ROAD.

Two 24-inch mains from Wheel-House to Junction "A" on plan.....	32,000.00
From Junction "A" to Reservoir.....	9,800.00
	<hr/>
41,800 lineal feet of 24-inch at \$8.70.....	\$363,660.00
Passing under the Aqueduct and Lachine Canal.....	4,000.00
Cutting through rock 4,000 lineal feet, at \$3..	12,000.00
Stop-Valves and connections... ..	4,000.00
	<hr/>
	\$383,660.00

#### PUMPING MAIN TO JOIN THE PRESENT MAIN.

From Wheel-House to Junction "B.".....	44,000.00
From "B" to junction with present mains..	3,900.00
	<hr/>
47,900 lineal feet at \$8.70.....	\$416,730.00
Cost of crossing of Aqueduct, Canal and connections, and rock as above.....	20,000.00
	<hr/>
	<u>\$436,730.00</u>

Estimate No. 2 of the probable cost of the works  
of a capacity sufficient to pump 30 millions of gallons  
in 24 hours into the Reservoir of McTavish Street:—

**CRIB WORK AT 350 FEET FROM THE SHORE,  
SIMILAR TO THAT DESCRIBED IN NO. 1  
ESTIMATE AND PUDDLE WALL.**

41,107 cubic yards of crib at \$2.15 .....	\$86,380
12,894   "       "   of puddle at 50 cents.....	6,447
	<hr/>
	\$92,827

**MACHINERY AND WHEEL-HOUSE.**

Nine Turbines, with pumps, &c.....	360,000
Buildings for do.....	270,000
	<hr/>
	\$630,000

**THREE 30-INCH PUMPING MAINS FROM WHEEL-  
HOUSE TO CÔTE ST. ANTOINE RESERVOIR.**

41,800 } 62,700 lineal feet at \$14.50 .....	\$909,150
20,900 }	
Passing under Canal and Aqueduct .....	6,000
Cutting through rock.....	18,000
Valves and connections, &c.....	12,000
	<hr/>
	\$945,150

**PUMPING MAINS TO JOIN THE PRESENT MAINS.**

From Wheel-House to junction with present mains, 71,850 lineal feet at \$14.50.....	1,041,925
From junction to the McTavish Reservoir, 21,000 lineal feet at \$14.50.....	304,500
Rock, crossing Aqueduct, Canal connections, as above.....	26,000
	<hr/>
	<u>\$1,372,425</u>



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ANALYTICAL REPORT  
ON  
THE WATER SUPPLY.

BY DR. BAKER EDWARDS,

Bishop's College, Montreal.

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ANALYTICAL REPORT  
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THE WATER SUPPLY.  
BY DR. BAKER EDWARDS,  
Bishop's College, Montreal.

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# ANALYTICAL REPORT

## ON

# THE WATER SUPPLY.

BY DR. BAKER EDWARDS,

Bishop's College, Montreal.

*To the Chairman of the Water Committee, City Hall, Montreal:*

DEAR SIR,—I have the honour of laying before you my report on the several samples of water which have been submitted to me for analysis by Mr. Lesage; and, in addition, to hand you the result of my analysis of several samples collected by myself from Niagara River, Lake Ontario, Toronto Bay, Long Sault Rapids and St. Ann's Rapids, which, I trust, will add to the completeness and usefulness of this report. I have numbered the samples as follows :

No.	Locality.	Date of Collection, 1872	Appearance.
1.....	R. Nord .....	April 26.....	Brownish.
2.....	Lake Kilkenny .....	April 26.....	Clear white.
3.....	R. Lacouaro .....	April 27.....	Brownish.
4.....	Town Supply .....	May 18.....	Turbid.
5.....	St. Ann's Rapids .....	June 2.....	Clear Brown.
6.....	Head of Aqueduct .....	June 2.....	Clear Brown.
7.....	Wheel-house .....	June 2.....	Slightly Turbid.
8.....	Reservoir .....	June 2.....	Clear Brown.
9.....	Middle of Niagara River .....	June 13.....	Pellucid.
10.....	Middle of Lake Ontario .....	June 13.....	Pellucid.
11.....	Long Sault Rapids .....	June 14.....	Pellucid.
12.....	Toronto Bay, near Water Works .....	June 14.....	Milky.
13.....	Town Supply .....	June 22.....	Clear Brown.
14.....	Town Supply to Laboratory .....	Sept. 23.....	Turbid.
15.....	R. Nord, above Clairmont Falls .....	Aug. —.....	Clear Brown.
16.....	Lake Masson .....	Aug. —.....	Clear White.
17.....	St. Lawrence River, South Side, oppo- site Head of Aqueduct .....	Sept. 17.....	Pellucid with [Green Tint.
18.....	Head of Aqueduct, above Lachine Rapids .....	Sept. 17.....	Brownish Tint.
19.....	Wheel-house .....	Sept. 17.....	Do.
20.....	Reservoir .....	Sept. 17.....	Do.
22.....	Workshops Supply .....	Sept. 17.....	Do.
22.....	Town Supply to Laboratory .....	Feb. 25, '73.	Pellucid Clear White.



We shall find it convenient to group these waters as follows :

*Group A.*—Waters from the North divided into two classes : 1st, Lake waters, pure and free from Alkali ; 2nd, River waters characterized by Organic Carbon and Alkaline Siliciates.

*Group B.*—Mingled waters of *Group A.* and *Group C.*, taken at different seasons of the year.

*Group C.*—River waters of the great chain of Lakes westward to Niagara River.

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#### REMARKS ON GROUP A.

*Group A.*—Class I. :—

<i>Nos.</i>	<i>Source.</i>
No. 1 & 15.....	R. Nord
No. 2 .....	R. Sac 'Ouaro.
No. 5 .....	R. Ottawa.

*Group A.*—Class II.—These are Alkaline Silicated Waters. They differ from each other less in kind than each one will differ from its own waters at different seasons of the year.

These River waters are all strongly tinged with brown colouring matter and vegetable-spores which, when exposed to light, rapidly germinate. They are all Silicious and Alkaline, and contain mere traces of Lime, Magnesia and Iron. R. Sac 'Ouaro is the most Alkaline of these three, and contains a little more matter in solution, both Mineral and Organic, but is of the same general character.

As potable waters they are, therefore, on a par, and, chemically speaking, may be regarded as very pure, soft waters. There are, however, some objections to this class of waters, from a sanitary point of view, viz. :

1st. Alkaline Siliciates cause Diarrhoea.

2nd. Shallow and sluggish streams collect during the summer season an enormous volume of Organic Germs and Spores, both animal and vegetable, which are unwholesome and should therefore be removed by filtration.

3rd. All these waters act as solvents on lead, and where the supply is intermittent, the contamination of lead is injurious to all consumers and poisonous to certain individual constitutions.

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# REMARKS ON GROUP B.

## Group B. —

No.	Source.	Date.
4.....	Town Supply.....	May 18, 1872.
6.....	Head of Aqueduct.....	June 2, 1872.
7.....	Wheel-house.....	Do.
8.....	Reservoir.....	Do.
13.....	Town Supply.....	June 22, 1872.
14.....	Laboratory Supply.....	Sept. 23, 1872.
18.....	Aqueduct.....	Sept. 17, 1872.
18.....	Wheel-house.....	Sept. 17, 1872.
20.....	Reservoir.....	Do.
21.....	Water-works shops.....	Do.
22.....	Laboratory Supply.....	Feb. 25, 1873.

The waters of the Town Supply differ entirely in their characters at different seasons of the year.

During the breaking up of the ice in the spring floods, a large quantity of very fine mud becomes disturbed by the ice carried down the river, and this mud remains suspended in the water. Thus Sample 4, being the Town Supply, even so late in the season as the 18th of May last, shows the large quantity of 14.1 grains of solid matter, chiefly consisting of this finely suspended mud which is chiefly Silica, with some Organic matters.

The samples, Nos. 6, 7 and 8, taken on the 2nd of June are free from this suspended matter and consist chiefly of Ottawa water, with its peculiar brown tint, due to the presence of Organic matter in solution, and minute Organic Spores. The Solid matter is then reduced from 14.1 grains to 7 or 8 grains per gallon.

The samples, Nos. 14, 18, 19, 20 and 21, taken in September show a larger proportion of St. Lawrence water, and contain some suspended matter. The total Solid contents, both Mineral and Organic, being now increased to about ten grains to the gallon, and the hardness proportionately increased.

Sample No. 22, on the other hand, being the water supply of Feb. 25th, 1873, is chiefly, if not entirely, St. Lawrence water, which has been diverted to the north by the frazil, or by ice currents above the rapids.

It is perfectly clear and pellucid, nearly free from Organic matter, and has the same degree of hardness as No. 17, taken from the South side of the St. Lawrence, opposite the Aqueduct, in September, 1872.

It would therefore appear that during the winter months, and beneath the ice, the currents are essentially changed, and we then obtain ST. LAWRENCE WATER of excellent quality; whilst after the fall of the winter level, and during the spring flood and summer, we have chiefly OTTAWA WATER.

## GENERAL CONCLUSIONS.

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I.—The Lake waters are very pure and free from alkalies. Like distilled water they attack and dissolve lead, and should not be stored in Leaden Cisterns if used as potable waters.

II.—The River waters of the North district offer no advantages over those of the Ottawa except in their elevation.

III.—The waters of the St. Lawrence, in point of purity, salubrity and regularity of character, at different periods of the year, are superior to those of the Ottawa River. Their immense volume, elevated level, rapid flow, rocky bed and well balanced Mineral ingredients render them, at such a point as Lake St. Francis, at the head of the Beauharnois Canal, probably the finest supply of water, both as to quantity and quality, to be found in the world.

IV.—The present supply is of very variable character, and requires (especially in the spring and fall of the year) settling beds and filters of sand and gravel to render it fit for consumption. The winter supply being chiefly St. Lawrence water is incomparably the best, and it would appear that this quality of water might be obtained throughout the year, by simply running out a culvert to the South side of the river, and thus obtaining a supply of the St. Lawrence water all the year round.

I have the honour to be, Sir,

Your obedient servant,

J, BAKER EDWARDS, Ph.D., D.C.L., F.C.S.,

Professor of Chemistry and Microscopy in Bishop's College,  
Faculty of Medicine, Montreal.

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## A D D E N D U M .

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MARCH, 1873.

Since the above report was handed in to the Committee have analyzed the two samples of water, collected on March 15th, from the Cascades Rapids and from St. Anne's Lock, from which it would appear that this year, at this season, a large volume of St. Lawrence water sets North of Isle Perrot and falls over St. Anne's Rapid.

J. B. E.

**GENERAL TABLE OF ANALYSIS.**

Name of Group. No.	Locality.	Date of Collection.	Mineral Contents.	Organic Carbon.	Total Solid Contents.	Degrees of Hardness. (Clarke.)	Appearance.
Group A. Class I..... Class II.....	L. Kilkenny.....	April 26, 1872.....	2.15	1.10	3.25	0.5	Clear White.
	L. Masson.....	July, 1872.....	2.05	1.05	3.10	0.5	Do.
	R. Nord.....	April, 1872.....	2.70	1.80	4.50	1.2	Yellowish Brown.
	R. Ouara.....	Do.....	3.95	2.20	6.15	1.1	Brownish.
	R. Ottawa.....	June, 1872.....	2.30	1.90	4.20	1.2	Do.
	R. Nord, above Falls	August, 1872.....	2.80	1.75	4.55	1.2	Do.
	Town Supply.....	May 18, 1872.....	10.00	4.01	14.01	1.7	Turbid.
	Aqueduct.....	June 2, 1872.....	5.01	2.01	7.02	1.6	Clear Brown.
	Wheel-house.....	Do.....	6.02	2.03	8.05	1.6	Do.
	Reservoir.....	Do.....	5.04	2.01	7.05	1.7	Do.
Group B.....	Town Supply.....	June 22, 1872.....	6.00	2.02	8.02	1.7	Do.
	Aqueduct.....	Sept 17, 1872.....	8.02	2.01	8.03	2.5	Milky White.
	Wheel-house.....	Do.....	7.05	2.02	9.07	2.3	Do.
	Reservoir.....	Do.....	7.75	2.00	9.75	2.3	Do.
	Wheel-house Supply	Do.....	7.00	2.00	9.00	2.3	Slightly Milky.
	Laboratory Supply.....	Feb. 25, 1873.....	7.25	2.00	9.25	2.3	Do.
	Niag. & St. Lawrence	June, 1872.....	7.50	1.60	8.5	3.6	Clear White.
	S. Shore St. Lawrence	Sept, 1872.....	6.60	1.1	7.7	3.5	Do.
	Toronto Bay.....	June, 1872.....	7.80	1.1	8.9	3.45	Do.
			....	....	....	....	Very Turbid.
Group C..... { 9, 10, 11, 6							

**ADDENDA, MARCH 1873.**

23	St. Lawrence, Pont aux Cascades	March, 1873.....	6.1	1.1	7.2	3.50	Clear White.
	Ottawa River, St. Anne's Lock.	March, 1873.....	4.4	1.8	6.2	2.5	Clear Slightly tinged Brown.

## GENERAL CONCLUSIONS.

---

I.—The Lake waters are very pure and free from alkalies. Like distilled water they attack and dissolve lead, and should not be stored in Leaden Cisterns if used as potable waters.

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J, BAKER EDWARDS, Ph.D., D.C.L., F.C.S.,

Professor of Chemistry and Microscopy in Bishop's College,  
Faculty of Medicine, Montreal.

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## ADDENDUM.

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MARCH, 1873.

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J. B. E.

PRESENTED BY

*W. S. B. Wister*

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# ANNUAL REPORT

OF THE

SEPERINTENDENT

OF THE

## MONTREAL WATER WORKS

FOR THE

YEAR ENDING 31st JANUARY 1874.

PRINTED BY ORDER OF THE WATER COMMITTEE.



PRINTED BY LOUIS PERRAULT & CO., 45 ST. JAMES STREET.

1874.

DUPLICATE EXCHANGE 2 JULY 1901.

U.S. SOC. CIVIL ENGINEERS



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1901

ANNUAL REPORT  
OF THE  
SUPERINTENDENT OF THE MONTREAL  
WATER WORKS,

FOR THE YEAR ENDING THE 31st JANUARY, 1874.

---

*To the City of Montreal.*

According to the rules of the Council, I herewith respectfully submit my Annual Report for the year 1873.

AQUEDUCT.

The cleaning of the Aqueduct begun in the summer of 1872, was continued during last summer. The water for this purpose was drawn out of the Aqueduct at different occasions, viz: on the 10th and 24th of July, 2nd and 25th September last.

As circumstances would not allow the water to be drawn off for more than a day at a time, very little progress was made. This, however, with what can be accomplished during next summer, by the addition to the plant of two new derricks and four scows, will no doubt complete the cleaning of the lower portion of the Aqueduct from the Wheel House to the regulating gates at the Rock Cut.

The fences, bridges and ditches along the line have also had their usual repairs, and have been maintained in good order. It will be necessary to renew one of the farm bridges at Hedly's farm and some of the fences near the Entrance.

**WHEEL HOUSE.**

At the Wheel House, the machinery has been kept as efficient as possible, by making the necessary repairs.

A pair of high pressure steam engines with the necessary gearings has been connected to the Turbine Wheel and its machinery in order to help the latter during the winter months when the water power is deficient. This work was executed by Messrs. W. P. Bartley & Co., for the sum of \$19,750, and was set in operation in January last. A new Bevel Wheel has also been made to replace the present one, which threatens to give way at any moment.

The following schedule shows the work of these wheels:

SCHEDULE showing the duty of the two Breast Wheels.

MONTH	Revolutions Wheel No. 1.	Revolutions Wheel No. 2.	Total No. of Revolutions.	Number of Gallons Pumped.	Olive Oil in Gallons.	Coal Oil in Gallons.	Tallow in Pounds.	Coal for Fuel in Pounds.
1873								
February .....								7,210
March .....								1,258
April .....	156,162	313,116	469,272	69,452,356	4.44	3.04		500
May .....	65,521	512,663	578,184	85,571,232	7.22	5.93		
June .....	416,224	433,090	849,314	125,695,472	9.72	5.00		
July .....	474,423	443,667	918,090	135,877,320	8.61	4.67		
August .....	464,171	453,739	917,910	135,850,680	9.16	6.54		
September .....	271,791	337,434	609,225	90,165,300	8.33	6.86		
October .....	340,410	241,508	581,918	86,123,564	7.50	7.48		
November .....	61,993	347,678	409,671	60,631,308	6.66	8.73	8.00	4,430
December .....	128,944	385,912	514,856	76,195,688	5.83	9.98		3,220
January 1874 .....	191,270	475,469	666,739	98,677,372	7.22	9.67		8,120
Total .....	2,570,909	3,944,270	6,515,179	964,246,492	74.69	66.90	10.08	29,738
Last year .....	1,764,817	2,634,698	4,399,515	651,128,220	41.85	43.85	6.00	26,054

SCHEDULE showing the duty of the Turbine Wheel.

MONTH	Revolutions.	Number of Gallons Pumped	Olive Oil in Gallons.	Coal Oil in Gallons.	Tallow in Pounds.	Coal for Fuel in Pounds.
1873						
February .....	70,691	16,471,003	.....	9.48	.....	8,440
March .....	9,742	2,269,886	.....	6.81	5.00	7,580
April .....	361,717	84,280,061	8.05	13.75	32.00	6,400
May .....	541,933	126,270,389	10.55	4.99	17.00	2,040
June .....	473,305	110,280,065	9.82	4.67	.....	.....
July .....	452,748	105,490,284	10.68	4.90	56.12	.....
August .....	466,950	108,799,350	10.27	6.55	16.00	.....
September .....	495,739	115,507,187	11.66	8.73	30.00	.....
October .....	584,075	136,089,475	15.55	9.04	30.00	2,490
November .....	519,829	121,120,157	16.90	10.60	13.12	3,370
December .....	426,656	99,410,848	14.16	11.85	.....	12,170
January 1874 .....	317,603	74,001,499	13.61	14.03	19.00	12,560
Total .....	4,720,988	1,099,990,204	121.25	105.40	198.24	61,050
Last year .....	4,595,961	1,070,870,563	88.96	81.79	76.05	49,768

The breast wheels have pumped 964,246,492 gallons, and the Turbine Wheel, 1,099,990,204 gallons.

The following are the alterations and repairs required to be made to the Water Pumping Machinery. A contract for removing one of the Breast Wheels and replacing it by a Turbine Wheel has been awarded to Messrs. W. P. Bartley & Co., for the sum of \$13,250.

This work which should have been completed by the month of December last, was only commenced late in the January following and is not likely to be completed before May.

The object in changing the Breast Wheel for a Turbine is to make use of an additional fall of water of seven feet, which is lost by the use of the Breast Wheel.

While this work is going on it will be necessary also to secure more firmly one of the pumps to its foundation plate, to renew all the brass of the cross heads, and to repair some of the connection joints which are leaky.

The small Bilge Pump in the pump room requires also new valves and valve chests.

In the old Turbine Wheel Machinery, the spur wheel whose wooden cogs are worn out requires new ones, the new Bevel Wheel to be put in place of the old one, the valve chests which are split to be strengthened by additional bolts, and new valve chests in duplicate to replace the old ones in case of total failure of the latter; new guides and cross heads more suitable than the old ones should also be provided. Very little repair has been done to the Wheel House. The whole machinery requires repainting; the floor of the Turbine House is bad and requires renewing. Outside, the flumes of the Breast Wheels have been repaired and a stone stair put in place of the old wooden one at the north end of the building.

---

The expenditure during the year at the Wheel House has been as follows.—

Repairs to Wheel House and Buildings.....	\$289,43
“      Grounds around Buildings.....	307,83
Supplies.....	1002,75
Staff's Salary.....	3840,00
	<hr/>
	\$5440,01

Quantity of water pumped by wheels.....	2,064,236,696
gallons raised 165 feet high.	
Cost per million of gallons.....	\$2,63
Cost per million of gallons raised one foot high.....	0,01, <sup>8</sup> / <sub>10</sub>

#### ENGINE HOUSE.

During last summer the steam pumping Engines were thoroughly overhauled and both are now in good working order. The broken valve chest of No. 2 Engine was satisfactorily replaced by a new one. The pump which had worked loose from the foundation was substantially secured in its proper position. The delivery pipe in the air vessel which was the cause of so much trouble is now set right, and causes no more annoyance. The fly wheel of this Engine being too light was rendered heavier by the addition of  $3\frac{1}{2}$  tons of metal, and the steam pipes covered with felt encased in black walnut and brass hoops

The pistons of both Engines have been repacked with new rings and made tight, new stairs and platforms have been attached to the frames of the Engines, giving a better access to their different parts.

The Engines have pumped during the year 638,296,632 gallons, that is No. 1, 312,205,783 gallons No. 2, 326,090,849 gallons as seen by the schedule below.

All the boilers are in excellent condition, excepting one of the Cornish boilers which is leaking round the steam drum, and must be repaired during the coming summer. These cornish boilers which have only been temporarily finished during the winter previous, were completed during the summer and new cast iron fronts put in. All the steam pipes have been covered with hair felt, wood and iron hoops.

The furnaces of the tubular boilers were also repaired and will again require to be repaired, as well as those of the cornish boilers during the course of next summer as well as some of the cold air flues.

The Engine and Boiler houses are in good repair and very little has been spent upon them. The floor of the Engine room has been covered with oil cloth which adds very much to its appearance. A new room off the Engine room is very much required for the use of the men employed in the boiler house to be used also as a repair shop. I would therefore recommend one to be built at the back of the Engine

near the chimney. The fuel used for steam has been the **Lackawana** coal, about equally mixed with Nova Scotia coals, **Black Diamond** and **Intercolonial** coals. The first has not given the satisfaction expected from it, a great deal of sloggs and ashes having been left behind. Although the price per ton was lower than that of the Nova Scotia Coals, I think it is not so profitable in the end. The expenses attending the running of the steam works are still very high, due in great measure to the high price of coal last year, and the want of accommodation for handling it. This can however be remedied by taking the proper means to have a coal shed convenient to the work and a tramway to run the coals to the furnaces.

SCHEDULE shewing the duty of Engines No 1 and 2.

MONTH.	ENGINE No. 1.		ENGINE No. 2.		Number of Gallons pumped during the month.	Coals consumed for pumping, in pounds.	Coals consumed for banking fires in pounds.	Olive Oil in gallons.	Coal Oil in gallons.	Number of pounds of coals to raise one million gallons.	Average pressure of water on the Pump Pistons.	
	Running Time	Revolutions.	Running Time.	Revolutions.							No 1	No 2
1873	H. M.		H. M.									
February.....	568,20	455,112	80,950,771	603,844	167,405,732	1392,220	7,400	29,70	47,57	7,445	75	80
March.....	701,25	544,595	96,867,112	672,15	664,856	118,257,937	4,458	31,84	55,40	7,261	68	77
April.....	220,15	167,890	29,859,037	203,00	34,787,992	384,160	590	10,69	26,31	6,107	72	75
August.....	133,25	117,085	26,825,908	.....	.....	132,470	5,900	3,88	4,71	6,689	85	.....
September.....	202,35	159,051	28,290,401	49,25	7,713,688	261,800	15,500	7,21	17,36	7,923	83	79
October.....	.....	.....	.....	.....	.....	.....	.....	1,38	5,40	.....	.....	.....
November.....	63,20	38,790	6,899,577	117,20	17,212,302	175,070	9,866	7,45	15,11	7,730	76	76
December.....	156,35	110,247	19,609,634	161,20	22,319,840	357,090	17,340	8,88	26,33	9,132	77	72
1874												
January.....	235,20	162,497	28,903,343	138,46	18,393,358	436,580	17,180	8,04	32,69	9,611	73	74
Total.....	2,281,15	1,755,267	312,295,783	1,945,46	1833,310	326,090,849	4696,803	78,228	109,11	230,88	7,725	.....



The expenditure during the year at the Engine House has been as follows :—

Ordinary repairs to building.....	\$356,43
Supplies to Engines.....	1,496,59
Coals 2132 tons @ \$7,90.....	16,842,80
	<hr/>
	18,695,82
Wages of men at Engines.....	5,009,87
	<hr/>
	\$23,705,69

Quantity of water pumped by steam during the year, 638,296,632 gallons, raised 165 feet high

Cost per million of gallons.....	\$37,13
Cost per million of gallons raised one foot high.....	0,22

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#### TAIL RACE.

The dam of the Tail Race is in the same condition as last year. The necessary repairs were done to the banks, ditches and fences. The bridges are all in good repair with the exception of that on the lower Lachine road which would look better with a new coat of paint.

The bank at the lower end of the dam should be cut through to the river, and the few obstructions at different parts of the Tail Race, removed, in order to lower the level of the water as much as possible. The arches at the wheel house on the Tail Race should also be permanently trapped to prevent the cold air from entering the wheel pits.

It may be proper to mention here the forming and grading of Mullins street running parallel and contiguous to a piece of land owned by the City at Point St. Charles.

The work was done by contract at a cost of one thousand dollars.

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#### PIPE TRACK.

Nothing has been done on the Pipe Track, except the cleaning of the valves of the pumping mains. In January one of the pumping mains gave way a little above the Culvert under the Lachine Canal and caused the Department a good deal of trouble and anxiety. All the valves on the pumping mains and the mains themselves are in good order.

## RESERVOIRS.

The Reservoir on McTavish street is in the same state as last year, except that the interior of the valve house has been repaired and painted. The slope dry stone wall in front of this valve house is in a dilapidated condition and should be rebuilt. The rock excavation at the back of the Reservoir is slowly progressing and the road department is now engaged in taking out of it 1500 toises.

At the Coteau Baron Reservoir a new fence has been put all round the inside slope.

SCHEDULE showing the Level of Water and Evaporation at the McTavish Street Reservoir, for the year 1873.

MONTH.	Average Monthly. Depth.	Rain Gauges in Inches.				Evaporation in Inches.
		Rain.	Snow.	Reduced to Rain.	Total Rain.	
1873.						
February.....	21.06	.....	10.04	1.38	1.38	1.56
March.....	17.00	1.06	40.02	4.71	5.77	1.80
April.....	19.41	2.12	.....	.....	2.12	3.05
May.....	22.16	1.06	.....	.....	1.06	4.58
June.....	22.22	2.26	.....	.....	2.26	5.25
July.....	17.86	2.19	.....	.....	2.19	4.89
August.....	17.75	1.80	.....	.....	1.80	4.46
September.....	19.95	3.85	.....	.....	3.85	2.48
October.....	21.30	5.31	1.00	0.17	5.48	2.17
November.....	21.63	0.80	24.00	2.19	2.99	1.06
December.....	21.42	0.81	9.05	0.80	1.61	1.47
1874.						
January.....	21.00	0.80	24.00	2.19	2.99	1.06
Total.....						
Last year.....	.....	22.06	108.11	11.44	33.50	33.83
		13.30	94.81	8.32	21.66	30.33

The following schedule shows the average daily consumption to have been 7,399,896 imperial Gallons, against 6,665,136 imperial Gallons last year being a daily increase of 734,760 gallons. In this are included 2,292,960 gallons for fire purposes, 35,594,000 gallons for watering the streets and 241,450 gallons for flushing sewers and flooding Rinks,

COMPARATIVE SCHEDULE showing the Daily Consumption for each Month, from 1864, to 1873 in the City of Montreal

Daily Average.	1864.	1865.	1866.	1867.	1868.	1869.	1870.	1871.	1872.	1873.
January.....	4,343,153	4,426,068	4,060,503	4,809,262	3,665,329	4,322,122	5,490,715	5,678,174	5,974,840	7,290,852
February.....	3,523,169	2,986,838	2,219,809	5,229,869	2,725,756	2,478,917	4,082,132	6,108,120	5,449,747	7,063,017
March.....	3,332,475	3,760,457	2,562,627	4,827,717	3,717,735	1,671,831	3,428,207	6,485,962	4,900,149	7,012,675
April.....	4,003,223	4,493,937	4,538,395	5,850,820	5,293,004	4,583,000	5,475,387	6,356,588	8,064,601	7,279,311
May.....	3,856,934	3,187,978	4,538,332	5,284,999	4,787,956	4,498,936	5,881,214	6,559,613	7,282,758	6,833,600
June.....	4,025,742	4,928,084	4,708,153	6,036,586	4,966,311	5,147,939	6,397,578	6,569,112	7,392,330	7,865,951
July.....	4,381,352	4,754,354	5,690,600	6,456,322	5,978,677	5,074,155	6,717,105	6,814,104	7,643,349	7,786,051
August.....	9,602,058	5,403,834	5,639,903	6,075,179	5,765,896	5,543,778	6,684,834	7,142,800	6,543,069	8,563,739
September...	4,239,849	4,974,663	5,478,200	5,499,087	5,916,460	5,919,435	6,518,369	6,780,880	7,224,962	8,055,885
October.....	4,323,540	4,531,097	5,460,095	6,580,319	5,586,033	5,605,714	5,837,073	6,547,957	6,615,049	7,168,172
November.....	3,728,530	3,449,815	5,625,380	5,112,411	4,262,538	5,131,885	6,117,934	6,046,708	6,288,247	6,862,111
December....	4,213,023	4,332,526	5,624,358	4,718,387	4,511,390	5,156,472	6,012,224	6,104,278	6,622,527	7,017,387
Total.....	48,572,049	51,228,651	56,146,355	65,337,025	57,177,085	55,134,894	68,643,672	77,194,296	79,981,628	88,798,751
Daily average.										
for the year..	4,047,670	4,269,054	4,678,863	5,444,752	4,819,489	4,594,574	5,720,306	6,432,858	6,665,136	7,399,896
Increase.....	118,091	221,384	409,809	765,889	.....	.....	1,125,732	712,552	232,278	734,760
Decrease.....	.....	.....	.....	.....	625,263	224,915	.....	.....	.....	.....

**SCHEDULE showing the Average Daily Consumption of Water in Imperial Gallons, for the year 1873, as compared with that of 1872.**

MONTH 1873.	Average 1873.	Average 1872.	Increase.	Decrease.	Total con- sumption for 1873.
February.....	7,315,268	5,449,747	1,865,521	.....	204,827,506
March.....	7,012,675	4,900,149	2,112,526	.....	217,392,935
April.....	7,279,311	8,064,601	.....	785,290	218,379,346
May.....	6,833,600	7,282,758	.....	449,158	211,841,621
June.....	7,865,951	7,392,330	473,621	.....	235,978,537
July.....	7,786,051	7,643,349	142,702	.....	241,367,604
August.....	8,563,739	6,543,069	2,020,670	.....	265,475,938
September.....	8,055,885	7,224,962	830,923	.....	241,676,576
October.....	7,168,172	6,615,049	553,123	.....	222,213,339
November.....	6,862,111	6,268,247	593,864	.....	205,863,344
December.....	7,017,387	6,622,527	394,860	.....	217,539,010
1874					
January.....	7,095,986	4,899,757	2,196,229	.....	219,975,572
Total.....	88,856,136	78,906,545	11,184,039	1,234,448	2702,531,328
D'y Av'ge 1873.....	7,404,678	Monthly Av'ge 1873 " " 1872			225,210,944
" " 1872.....	6,617,097				201,270,044
Av'ge D'y Inc. ....	787,581				23,940,900

**WORK SHOP.**

The state of the Work Shop corner of Lagauchetière and St. Charles-Borromée Streets is unaltered, except that a new platform scale of ten tons has been erected in the yard. Steps should be taken to provide on the premises, dwellings for the foreman and valve man.

# PIPE LAYING.

SCHEDULE showing the Pipes, Hydrants, Valves, Services, &c, laid down in the City of Montreal during the year 1873.

NAMES OF STREETS.	LENGTH IN FEET OF CAST-IRON PIPES.					LEAD	NUMBER OF VALVES.						Hydrants.	Brick Chambers.	Houses Supplied.	Length of Lead Pipe in feet.	Weight of Lead Pipe in lbs.	Stop-Cocks.
	3 in.	10 in.	8 in.	6 in.	4 in.		12 in.	10 in.	8 in.	6 in.	4 in.	Total						
<i>East Ward.</i>																		
St. Paul.....															1	13	26	1
St. Louis.....															1	27	54	1
Total.....															2	40	80	2
<i>Centre Ward.</i>																		
Commissioners.....															2	45	135	2
Lane off St. Sulpice.....															1	73	219	1
St. James.....					243										4	77	170	4
DeBresoles.....				297											4	96	192	4
St. Gabriel.....		450	9					1				1	2	2	2	58	166	2
St. Vincent.....															1	23	46	1
Craig.....															.....	.....	.....	.....
Total.....	450	9	297	243	999		1	1	1	2	4	2	2	2	14	372	928	14
<i>West Ward.</i>																		
St. Peter.....															9	293	815	9
Foundling.....															1	24	48	1
Fortification.....															1	16	56	1
St. Helen.....															1	28	130	1
Notre Dame.....															1	28	130	1
McGill.....		40													.....	.....	.....	.....
St. John.....				200											1	20	93	1
Craig.....				1125	1125						1	1	1	1	1	.....	.....	.....
Total.....	40			1325	1365						1	1	1	1	14	409	1272	14

<i>St. Ann's Ward.</i>														
Mullin.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Forfar.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Richardson.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Queen.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
William.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
College.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Seigneurs.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Condé.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Murray.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Common.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
King.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
St. Patrick.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
St. Ann.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Other.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Kempt.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Grand Trunk.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wellington.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Magdalen.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
St. Joseph.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
St. Augustin.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Centre.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Conway.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Britannia.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Nazareth.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Hunter.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Ottawa.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
McCord.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Manufacturers.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Prince.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Richmond.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Basin.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Carried forward....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	297	574	871	328	1	1	1	1	12	13	97	2742	7034 <sup>1</sup>	99

\* 15 Jets on Champ-de-Mars.

SCHEDULE showing the Pipes, &amp;c.,—(Continued.)

NAMES OF STREETS.	LENGTH IN FEET OF CAST-IRON PIPES.					LEAD	NUMBER OF VALVES.						Hydrants.	Brick Chambers.	Houses Supplied.	Length of Lead Pipe in feet.	Weight of Lead Pipe in lbs.	Stop-Cocks
	3 in.	4 in.	6 in.	8 in.	10 in.		12 in.	10 in.	8 in.	6 in.	4 in.	Total						
<i>St. Ann's Ward.</i>																		
Drought forward.....	....	....	297	....	574	871	328	....	....	1	....	1	12	13	97	2742	7034½	99
Congregation.....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	40	80	2
Menai.....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	48	114	2
Mill.....	890	....	....	....	....	890	....	....	....	....	....	....	....	....	....	....	....	....
St. Etienne.....	290	....	....	....	....	290	....	....	....	1	....	1	....	....	....	....	....	....
Total.....	1180	....	297	....	574	2051	328	1	....	2	....	3	12	13	101	2830	7228½	103
<i>St. Antoine Ward.</i>																		
Chatham.....	....	....	....	....	5	5	....	....	....	....	....	....	1	1	5	121	333	5
Mansfield.....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	9	280	653	9
St. Joseph.....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	12	268	542	11
St. Bonaventure.....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	6	229	499	6
St. Martin.....	....	....	....	....	219	219	....	....	....	....	....	....	1	1	5	140	338	5
Aqueduct.....	....	....	....	....	10	10	....	....	....	....	....	....	1	1	4	105	264	4
Lorne Avenue.....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3	67½	202½	3
Lusignan.....	....	....	....	....	808	808	....	....	....	....	1	1	1	2	9	235	498	9
Fulford.....	....	....	....	....	450	450	....	....	....	....	1	1	....	1	11	347½	772½	11
Stanley.....	....	....	....	....	225	225	....	....	....	....	1	1	....	1	2	103	309	2
St. Antoine.....	....	....	....	....	15	15	....	....	....	....	....	....	1	1	4	107	249	4
Guy.....	....	....	210	....	81	291	....	....	....	....	....	....	....	1	2	76	173	2
Drummond.....	....	....	....	....	208	208	....	....	....	....	....	....	....	1	2	93	238	2
McTavish.....	....	....	....	....	146	146	....	....	....	....	....	....	1	1	3	136	343	3
St. David Lane.....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3	62	186	3
St. Michael Lane.....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	14	42	1
Richmond.....	....	....	....	....	70	70	....	....	....	....	....	....	....	....	1	35	105	1





SCHEDULE showing the Pipes, &c., laid down—(Continued.)

NAMES OF STREETS.	LENGTH IN FEET OF CAST-IRON PIPES.							LEAD	NUMBER OF VALVES.							Hydrants.	Brick Chambers.	Houses Supplied.	Length of Lead Pipe in feet.	Weight of Lead Pipe in lbs.	Brass Stop-Cocks.			
	3 in.	10 in.	8 in.	6 in.	4 in.	Total.	12 in.		10 in.	8 in.	6 in.	4 in.	Total.											
<i>St. Antoine Ward.</i>																								
Brought forward.....		1168	.....	2526	4821	8515	102	.....	1	.....	3	9	13	27	38	174	5857	13232	173					
Crescent.....																	28	56	1					
Seigneurs.....																	118	284	6					
Metcalfe.....					15	15								1	1		.....	.....	.....					
Rolland.....																	17	34	1					
Richmond Square.....					180	180											6	187	411	6				
Ste Marguerite.....				360		360					1		1		1		48	96	1					
Simpson.....																	3	6	.....					
Total.....		1168	.....	2886	5016	9070	102	.....	1	.....	4	9	14	28	40	189	6258	14119	188					
<i>St. Lawrence Ward.</i>																								
Mayor.....																	22	66	1					
Berthelet.....																1	39	117	1					
Durocher.....																3	56	134	3					
Craig.....																7	178	508	7					
St. Lawrence.....																12	368½	1109½	12					
Côté.....																1	36	171	1					
St. Urbain.....				1833	180	2013				2		2		1	2	7	237	490	7					
Dorchester.....																	22	44	1					
Ontario.....																2	79	158	2					
Hôtel-Dieu.....				182	3	185					1		1		1		34	68	1					
Lane off LaGauchetière.....							187									3	60	120	6					
Sherbrooke.....																	46	92	1					
Anderson.....					36	36										2	29	67	2					
St. Catherine.....																2	36½	85½	2					



Schedule showing the Pipes &amp;c., laid down—(Continued.)

NAMES OF STREETS.	LENGTH IN FEET OF CAST-IRON PIPES.					LEAD	NUMBER OF VALVES.					Hydrants.	Brick Chambers.	Houses Supplied.	Length of Lead Pipe in feet	Weight of Lead Pipe in lbs.	Brass Stop-Cocks.
	3 in.	10 in.	8 in.	6 in.	4 in.	Total	12 in.	10 in.	8 in.	6 in.	4 in.	Total					
<i>St. James Ward.</i>																	
Brought forward.....					36	36								59	1835	4267	59
Amherst.....				390	9	399								24	706	1806	24
Wolfe.....				54	18	72								30	687	1716	30
Labelle.....														2	74	186	2
Ontario.....					9	9								4	207	463	4
Berri.....														1	25	75	1
St. Hubert.....														12	618	1306	12
Maple avenue.....				855		855								6	142	373	6
Rapallo.....														2	139	417	2
St. Catherine.....														2	58	145	2
Dorchester.....														2	63	126	2
Craig.....														2	140	280	2
St. Christophe.....					1328	1328					1	1		10	279	569	10
Jacques Cartier.....														4	122	244	4
St. Denis.....				54		54				2				2	76	148	2
Roy.....				1048		1048								1	54	108	1
Cherrier.....				234		234								1	8	16	1
Lane off Ontario.....				144		144				1				4	85	170	4
Montana.....					297	297								10	291	582	10
Mignonne.....					216	216											
Sherbrooke.....				27		27								1	48	96	1
Robin.....														1	18	36	1
Brock.....																	
Total.....				2662	2057	4719	300			2	2	4	8	11	5675	13131	180



SCHEDULE showing the Pipes, Hydrants, and Valves laid down, and the number of Houses supplied with Water, in the City of Montreal, up to January, 1874.

WARDS.	LENGTH OF MAIN PIPE IN FEET.												NUMBER OF VALVES.										Hydrants.		Houses Supplied.	
																							Public.	Private.		
	24 in.	16 in.	12 in.	10 in.	8 in.	6 in.	4 in.	3 in.	Lead.	Total.																
East.....				3270	470	5140	6992		380	16252							6	18	3	33	30				61	609
Centre.....				1866	408	4723	7382		850	15229							2	6	21	2	31	28			52	605
West.....		630	965	4379	700	5621	10430		430	23045							1	9	23	3	43	35			72	698
St. Ann's.....				6787	12771	620	28243	47943		773	97137						8	14	1	38	76	1138	116		266	2482
St. Antoine.....				630	6818	5593	900	38398	82583	857	138229						2	10	3	43	112	1188	166		338	3864
St. Lawrence.....	1060	2020			3560	14921	27897		547	53177							3	3	18	46	5	75	63		132	2140
St. Louis.....				8084	1620	13241	28889	36	280	52100							6	1	13	39	5	64	75		133	2280
St. James.....				4778		34011	39655		450	68924							4	1	22	53		79	76		152	2447
St. Mary.....				5923		35513	33070		612	75118							6	1	36	40	2	84	89		174	2199
Total.....	1060	2650	14570	53176	7968	169711	384861	36	5179	538311	2	2	20	51	9	191	428	32	735	678	16	1370	16924			
Rising Main.....	26606		24			15	2798			29645	19	1	2				2								23	3
Grand Trunk R. R., Point St. Charles.....						2883				6111							2	3		5		10			15	
Montreal City Passenger R. R. Co., St. Mary St.....										1015															1	2
Military Government at Hochelaga.....										2180															1	2
Grand Trunk R. R., St. Bonaventure Street.....										645															2	4
Canadian Rubber Co., St. Mary Street.....										104															1	2
St. Lawrence glass Works, Delaisie Street.....										480															1	1
Anger's Ship Yard on Canal Bank.....										137															1	1
Bank of Montreal, Fortification Lane.....										47															1	2
Merchants Bank Fortification Lane.....										18															1	1
Montreal Telegraph Company, St. Sacrement St.....										18															1	1
Gazette office, Fortification Lane.....										20															1	1
Fisher & Son's Wool Factory, Basin St.....										108															1	1
E. Chanteloup, Côté Street.....										18															1	1
E. Chanteloup, Craig Street.....										27															1	1
St. George Church, Stanley Street.....										79															1	1
American Church, Drummond Street.....										49															1	1
Aug. Cantin, St. Joseph Street.....										72															1	1
Queens Hall, Ste. Catherine Street.....										28															1	1
John Redpath & Co., Coe's shop, Richardson Street.....										40															1	1
Total.....	27666	2650	14594	53176	7968	172151	392400	182	5179	574966	21	5	22	51	9	195	445	32	778	678	33	1432	16927			

The total length of cast iron pipes laid in the city during the year 1873 amounts to 27,088 lineal feet, viz : 2,798 feet of 10 inch ; 49 feet of 8 inch ; 12,631 feet of 6 inch ; 11,574 feet of four inch, and 36 feet of 3 inch, and 1,156 feet of 1 inch lead pipe ; 3 stop-cocks of 10 inches ; 16 do of 6 inch ; 17 do of 4 inch, and 69 fire hydrants. Also 882 service pipes laid to new houses. The total length of cast iron pipes laid in the city up to date is 27,666 feet of 24 inch ; 2,650 do of 16 inch ; 14,594 do of 12 inch ; 52,176 do of 10 inch ; 7,968 of 8 inch ; 172, 181 do of 6 inch ; 292,400 do of 4 inch ; 182 do of 3 inch. Also 5,179 feet of smaller main pipes, making a total length of 574,996 lineal feet of main pipe, or 108,90 miles.

There are now laid 21 stop-cocks of 24 inch ; 3 of 16 inch ; 22 of 12 inch ; 51 of 10 inch ; 9 of 8 inch ; 195 of 6 inch ; 445 of 4 inch, and 32 of  $2\frac{1}{2}$  inch ; making a total of 778 stop-cocks.

There are 711 fire hydrants, including 33 private ones.

The total number of houses supplied is 16,927.

The following schedules show that there have been 17 breaks and 13 leaks in the main pipes during the year 1873, and 25 stop cocks repaired. 50 fire hydrants have been repaired ; of these 3 have been entirely renewed.

Expenses incurred for repairs to Mains, Valves, Services, Streets Footpaths, and supplying water by Puncheons : \$9,614.50.

For repairs to Fire Hydrants and Inspection, \$3,069.95.

SCHEMATIC showing the Repairs done to Main Pipes, Hydrants and Valves, during the year 1873.

POSITION.	DATE 1873.	DIAMETER.					HOW REPAIRED.	PROBABLE CAUSE OF INJURY.
			VALVES.	HYDRANTS.	BREAKS.	LEAKS.		
Fullum near St. Catherine .....	Feb. 4	4 in.	1	1	1	1	Put in a new piece.	Settling of Earth on drain.
Durham near St. Catherine .....	" 10	4 in.	1	1	1	1	" " "	" " "
Aqueduct near St. Bonaventure .....	" 15	4 in.	1	1	1	1	Recalked the joint.	Joint blown out.
St. Augustin and Basin .....	" 18	4 in.	1	1	1	1	Put on a new Valve.	Valve worn out.
Beaudry and Ontario .....	March 1	4 in.	1	1	1	1	Put in a new piece.	Broken across drain.
St. John near Notre-Dame .....	" 6	4 in.	1	1	1	1	" " "	Bad Pipe.
Blanchard Lane .....	" 8	4 in.	1	1	1	1	Put on in a new Valve.	Valve worn out.
St. Bonaventure near Cemetery .....	" 8	4 in.	1	1	1	1	Recalked the joint.	Joint blown out.
St. Catherine and Panet .....	" 12	4 in.	1	1	1	1	Put on a new Valve.	Valve worn out.
St. Catherine and Murray .....	April 18	4 in.	1	1	1	1	" " "	" " "
St. Joseph and Murray .....	" 21	4 in.	1	1	1	1	" " "	" " "
Alexandre opp. the Gesu .....	" 23	4 in.	1	1	1	1	Put in a new Hydrant	Old one broken cause unknown.
Alexandre opp. the Gesu .....	" 23	4 in.	1	1	1	1	" " " Piece	Broken pipe.
St. Joseph and Colborne .....	" 26	10 in.	1	1	1	1	" " "	Piece blown out.
St. Urbain and St. Catherine .....	" 27	4 in.	1	1	1	1	" " "	Broken pipe.
Common and King .....	" 28	4 in.	1	1	1	1	Put on a new Valve.	Valve worn out.
Papineau R'd. and Ontario .....	" 29	4 in.	1	1	1	1	" " "	" " "
Radegonde St. ....	May 4	3 in.	1	1	1	1	Put in a new Piece.	Broken pipe.
St. Frs. Xavier at Post Office .....	" 8	4 in.	1	1	1	1	" " "	" " "
Sherbrooke and St. Lawrence main to Hyd't .....	" 8	4 in.	1	1	1	1	Put in a new joint.	Joint blown out.

Notre-Dame and St. Helen.....	May	10	.....	1	.....	Put on a new Valve.	Valve worn out.
St. James and St. Frs. Xavier.....	"	12	.....	1	.....	"	"
McGill and College.....	"	16	.....	1	.....	"	"
Parthenais near Ontario.....	"	17	4 in.	1	.....	Put in a new piece of pipe.	Split pipe.
St. Bonaventure and Cemetery.....	"	26	.....	1	.....	Put on a new Valve.	Valve worn out.
St. Joseph and Canning.....	"	26	.....	1	.....	"	"
St. Bonaventure and St. Felix.....	"	30	.....	1	.....	"	"
Lagauchetière and Anderson.....	"	31	.....	1	.....	"	"
St. James opp. Dollard.....	"	31	.....	1	.....	"	"
St. John near St. James.....	June	1	4 in.	1	.....	"	Pipe not good.
St. Paul and Dalhousie Square.....	"	2	.....	1	.....	"	Screw of spindle worn out.
Craig and St. Constant.....	"	4	8 in.	1	.....	"	Broken by gas cut.
Lagauchetière near Bleury.....	"	5	6 in.	1	.....	"	Broken a nozzle.
Lagauchetière and Berri.....	"	6	.....	1	.....	Put on a new Valve.	Valve worn out.
Wellington and St. Ann.....	"	7	.....	1	.....	Put in a new Hydrant.	Old one split by frost.
Sanguinet near St. Catherine.....	"	9	4 in.	1	.....	"	Split a nozzle.
Wellington and Murray.....	"	11	.....	1	.....	Put on a new Valve.	Valve worn out.
St. James and Place d'Armes.....	"	19	.....	1	.....	Put on a new valve.	Gate of Valve Broken.
Victoria St. above St. Catherine.....	"	20	.....	1	.....	Put on a new valve.	Valve worn out.
Durocher and Sherbrooke.....	"	20	.....	1	.....	Put in a new spindle.	Screw of spindle worn out.
Brook and St. Mary.....	"	21	.....	1	.....	"	"
Chenreville N. E.....	"	24	.....	1	.....	Put on a new valve.	Valve worn out.
St. Bonaventure & Little St. Antoine	"	24	.....	1	.....	Repairing Rod.	Rod Broken.
College and Inspector.....	"	24	.....	1	.....	Put in a new spindle.	Screw of spindle worn out.
Ottawa and Dalhousie.....	"	24	6 in.	1	.....	"	Plug blown out of branch.
St. Mary and Panet.....	"	28	.....	1	.....	"	Screw of spindle worn out.
Dorchester and Mackay.....	July	2	.....	1	.....	Put on a new valve.	Valve worn out.
Craig and Amherst.....	"	8	.....	1	.....	Put in a new spindle.	Screw of spindle worn out.
Hermine and Lagauchetière.....	"	8	.....	1	.....	"	"
Craig and Campeau.....	"	8	6 in.	1	.....	"	"
Carried over.....	.....	.....	.....	823	11	8	Split pipe.



SCHEDULE showing the Repairs done in Main Pipes, Hydrants and Valves, during the year 1873.—(Continued.)

POSITION.	DATE 1873	DIAMETER	VALVE	HYDRANTS	BREAKS	LEAKS	HOW REPAIRED	PROBABLE CAUSE OF INJURY
Brought forward.....			8	23	11	8		
Colborne and Smith.....	July 11.....	.....	.....	.....	.....	.....	Put on a new valve	Valve worn out
St. Denis and Ontario.....	" 14.....	.....	.....	.....	.....	.....	" "	" "
Condé and Centre.....	" 14.....	.....	.....	.....	.....	.....	Put in a new spindle	Screw of spindle worn out
Commissioners and St. Sulpice.....	" 17.....	.....	.....	.....	.....	.....	Put in a new valve	Gate of valve broken
Colborne and Wellington.....	" 22.....	.....	.....	.....	.....	.....	" " spindle	Screw of spindle worn out
Cathcart and St. Monique.....	" 24.....	.....	.....	.....	.....	.....	Put on a new valve	Valve worn out
St. Bonaventure and Richmond.....	" 26.....	.....	.....	.....	.....	.....	" "	" "
Craig and St. Constant.....	" 26.....	.....	.....	.....	.....	.....	" "	" "
St. Geneviève and Dorchester.....	" 28.....	.....	.....	.....	.....	.....	Put in a new spindle	Screw of spindle worn out
Campeau and Craig.....	" 28.....	.....	.....	.....	.....	.....	" "	" "
Water and Brook.....	Aug 1.....	.....	.....	.....	.....	.....	Put on a new valve	Valve worn out
Smith and Colborne.....	" 1.....	.....	.....	.....	.....	.....	Put in a new spindle	Screw of spindle worn out
Drummond and Dorchester.....	" 2.....	.....	.....	.....	.....	.....	" "	" "
Germain near Dumais.....	" 4.....	4 in.....	.....	.....	.....	.....	" "	" "
City Concillors and Sherbrooke.....	" 5.....	.....	.....	.....	.....	.....	" " piece	Broken pipe cause unknown
St. Gabriel and St. Paul.....	" 11.....	.....	.....	.....	.....	.....	Put on a new valve	" " by drain
St. Charles Borromée and Evans.....	" 12.....	.....	.....	.....	.....	.....	" "	Valve worn out
St. Catherine and Jacques-Cartier.....	" 19.....	.....	.....	.....	.....	.....	" "	" "
St. James and St. Gabriel.....	" 25.....	.....	.....	.....	.....	.....	Put in a new spindle	Screw of spindle worn out



SCHEDULE showing the Repairs done to Main Pipe, Hydrants and Valves during the year 1873,—(Continued.)

POSITION	DATE. 1873	DIAMETER	VALVE	HYDRANTS	BREAKS	LEAKS	HOW REPAIRED	PROBABLE CAUSE OF INJURY
Brought forward.....			25	42	17	13		
Jacques-Cartier near St. Catherine..	Nov 28	4 in					Put in a new piece	Broken, cause unknown
St. Antoine and Bisson.....	Dec 9			1			Put on a new valve	Valve worn out
St. Bonaventure and Inspector....	" 9			1			" "	" "
St. Paul and Jacques-Cartier Square	" 11			1			" "	" "
St. Bonaventure and Roy Lane....	" 16			1			" "	" "
Wellington and Duke.....	" 23			1			" "	" "
Blake.....	" 23			1			" "	" "
Montcalm.....	1874							
Mayor near Bleury.....	Jan 3			1			" "	" "
William.....	" 15	4 in					Put in a new piece	Broken cause unknown
	" 24			1			Put on a new valve	Valve worn out
Total.....		121	25	50	17	13		

**SCHEDULE** showing the number and position of Public Fountains erected in  
the City up to 1874.

POSITION.	Cast-Iron Basins.	Stone and Cement Basins.	Number of Jets.	Drinking Fountains Stand in Stone.	Drinking Fountains Stand in Iron.	Drinking Fountains Stand in Wood.	Cast-Iron Horse Troughs.
1. St. Mary, at Longueuil Ferry.....			1			1	1
2. Papineau Market.....			1			1	1
3. Papineau and St. Catherine Streets.....			1			1	1
4. Dalhousie Square.....			2		1		1
5. St. Denis, in front of St. James Church.....			2		1		
6. Viger Square, No. 1 Basin.....		3	1				
7. Do. do. No. 2 do.....		2	14				
8. Do. do.....			2	1			
9. Bonsecours Market.....			2			2	
10. Jacques Cartier Square.....			4		1		1
11. Court House Square.....	2	1	5	2			
12. St. Lawrence, at Guilbault's Garden.....			1			1	1
13. Place D'Armes Square.....	1	1	5		4		
14. Notre Dame & St. François Xavier Sts.....			1	1			
15. Custom House Square.....	2	1	1				
16. St. Ann's Market.....		1	2				1
17. Bleury and Dorchester Streets.....		1	1	1			
18. Victoria Square.....		1	9	1			
19. Craig Street, at Victoria Square.....			1	1			3 stone
20. Beaver Hall Square.....			2		1		
21. Phillips Square.....			2			1	1
22. Grey Nun and Common Streets.....			1			1	
23. Hay Market.....			1			1	1
24. Chaboillez Square.....			2		1		1
25. Sherbrooke St., near Drummond St.....		1	1			1	1 stone
26. Richmond Square.....		2	2				
27. St. Antoine Market.....			1			1	1
28. Seigneur and Basin Streets.....			1			1	1
29. McCord and Murray Streets.....			1			1	1
30. Mill Street, at Grant & Hall's Mills.....			1			1	1
31. Wellington and St. Etienne Streets.....			1			1	1
32. St. Gabriel Market.....			2	1		1	1 wood
33. Harbor, Jacques Cartier Basin.....			1	1			1 "
34. Do. at King's Basin.....			1	1			1 "
35. Do. at Queen's Basin.....			1				1 "
36. Papineau Road, near City Limits.....			1			1	1
37. St. Denis and Ontario.....			1			1	1
38. Guy and Sherbrooke.....			1			1	1
39. Viger Market.....			3			2	3
40. Dorchester and Visitation.....			1			1	
41. Wharf, opposite Quebec Gate Barracks.....			1			1	1
	5	12	85	10	9	24	30

## MANAGEMENT

STATEMENT showing the various details of the Expenditure on the Montreal  
Water-Works Department during the Civic Year 1873, ending January  
1874

## ADMINISTRATION

## AQUEDUCT

	\$	c	\$	c	\$	c
Paid for Repairs to Bridges and Fences.....	151.	82				
"    Converting Old Fences into Picket Fences ....	217.	00				
"    Cleaning Ditches and Repairing Banks.....	613.	77				
"    Cutting Weeds.....	71.	68				
"    Police Service.....	8.	00				
"    Cutting Ice and Snow.....	1138.	95				
"    Repairs to Scow and Boats.....	19.	20				
"    Allowance for Keeper's Horse.....	100.	00				
"    Keeper's Salary.....	600.	00				
					2920.	42

## WHEEL-HOUSE

Paid for Repairs to Buildings.....	289.	43				
"    Work on Ground around the Buildings	307.	83				
"    Supplies (including fuel for Heating	1002.	75				
"    Staff's Salaries.....	3840.	00				
					5440.	01

## ENGINE HOUSE

Paid for Repairs to Buildings.....	356.	43				
"    Supplies .....	1496.	59				
"    Wages of Men running Engines.....	5009.	87				
"    Fuel.....	40349.	05				
					47211.	94

## TAIL RACE

Paid for Repairs.....	95.	80				
"    Keeper's Salary.....	327.	60				
					423.	40

## PIPE TRACK

Paid for Repairs (including Cleaning of Valves)	39.	30				
					39.	30
Carried forward.....					56035.	07

	\$	c	\$	c	\$	c
Brought forward.....			56035.07			
RESERVOIR						
Paid for Repairs to Railings and Buildings...	478.57					
“ Fuel and Light.....	147.42					
“ Keeper's Salary.....	700.00					
			<u>1325.99</u>			
HYDRANTS						
Paid for Inspecting and keeping in order....	3069.95					
			<u>3069.95</u>			
PUBLIC FOUNTAINS						
Paid for Repairing—Wages—Material.....	294.82					
			<u>294.82</u>			
DISTRIBUTION PIPES						
Paid for Repairs to Valves, Mains, Services &c	8321.10					
“ Inspecting Services inside Houses....	769.25					
“ Watching at Valves.....	241.75					
“ Distributing Water & keeping Punc-						
cheons at Fire Stations.....	282.40					
			<u>9614.50</u>			
SHOP DEPARTMENT						
Paid for Men's Wages.....	5191.68					
“ Coals, Iron &c.....	1062.27					
“ Repairs to Buildings.....	36.95					
“ Instalment on Shop, 800.....	800.00					
			<u>7090.90</u>			
SUPERINTENDENT'S OFFICE						
Paid for Officers' Salaries.....	4758.38					
“ Turncocks .....	959.52					
“ Stationery, &c , Printing of Report...	942.26					
			<u>6660.16</u>			
MISCELLANEOUS						
Paid for Superintendent's Horse keep.....	400.00					
“ “ “ “ .....						
“ Buffalo Skins & Harness ..	100.00					
“ Carriage Hire for Committee.....	137.13					
“ Contingencies .....	110.00					
“ Damages.....	277.40					
“ School Taxes and Assessments.....	234.03					
“ Analysing Water.....	154.00					
“ Map for Distribution Pipes.....	221.75					
“ Grading Mullin Street.....	1000.00					
“ Repairing Côteau Baron Reservoir....	393.01					
			<u>3027.32</u>			
Carried forward.....			<u>87118.71</u>			

	\$	c	\$	c	\$	c
Brought forward.....			87	118.71		
COLLECTORS						
New for Bailiffs, Collectors, &c.....	2082.18					
.. Printing and Sundries.....	200.32	2282.50				
					89	401.21

## LOANS

## PIPE-LAYING

Paid for Cast-Iron Pipes.....	19242.94
" Lead Pipes, Pig Lead and Tin.....	8467.82
" Valve Stones.....	336.00
" Stop Cock Stones.....	147.00
" Special Castings.....	8323.15
" Brass Works.....	4126.84
" Timber and Planks.....	411.63
" Wages.....	19274.90
" Bricks.....	1064.00
" Cement and Lime.....	162.25
" Firewood.....	30.00
" Iron for Picks and Straps, Steel.....	1166.60
" Tools, &c.....	449.03
" Sundries.....	489.16
	<u>63691.32</u>

## NEW WORKS

Paid for Cleanning of Aqueduct.....	1359.09
" Alterations to Water Pumping Appa- ratus.....	1225.75
" Alterations to Steam Pumping Appa- ratus.....	4679.54
" McDougall's Contract for Steam Boi- lers.....	2820.44
" Bartley and Co's Contract for Altera- tions to Engine No.....	1500.00
" Bartley and Co's Contract for altering Water Wheels.....	3773.00
" Bartley & Co's Contract for repairing Pumps and Valves of Engine No 2.....	2100.00
" Bartley Contract for applying Steam to Turbine Wheel.....	11652.00
" New Cut, 1st Section.....	703.14
" Worthington Engine.....	6.00
" Meters.....	3753.90
" A Drawing Office.....	400.32
	<u>33973.18</u>
Carried forward.....	97664.50 89401.21

	\$	c	\$	c	\$	c
Brought forward.....			97664.50		89401.21	
INCREASE SUPPLY						
Paid for Extension of Reservoir.....			1204.37			
"    "    " Aqueduct.....			90.00			
"    Surveys.....			1667.03			
					2961.40	

## FINANCE DEPARTMENT

Paid for Advertising in the News papers &c.....	1167.90	101793.80
		\$191195.01

NOTE.—The difference between the above amounts and the Treasurer's accounts for the year is accounted for by the fact that the above represents all warrants issued, while the Treasurer's a/c shews those actually paid,—the above giving a correct statement of the actual working cost of the Departments for the period specified.

## ADMINISTRATION.

## NEW WORKS AND THEIR PROGRESS.

The enlargement of the Water Works has been steadily prosecuted. At the beginning of last season the Water Committee presented to the City Council their scheme for the proposed new Works, which consist of:

1st. A new Aqueduct, parallel to the present one, but on a three times larger scale.

2nd. Additional pumping machinery, with auxiliary steam engines.

3rd. New Rising Mains.

4th. A large Storage Reservoir, at the level of the present one, and another smaller Reservoir, at an elevation of 230 feet, to supply the inhabitants residing above the reach of the present Reservoir.

5th. The distribution pipes required to supply with water the high level district.

The whole at an estimated cost of \$4,019,972.



The scheme was adopted by the City Council on the 10th Sept. 1873 last, but, as the whole of the work has to be carried gradually into execution, only such portions of it as require immediate attention were recommended to be commenced. These were:

1st. The construction of the first section of the Aqueduct, with a still Water Basin at the entrance.

2nd. Another Pumping Engine.

3rd. A new Pumping main.

4th. The acquisition of the land necessary for a large Storage Reservoir. For this the City Council granted the Water Committee an appropriation of \$829,850, to be taken from the loan.

With the view of securing the best plan for the new steam Pumping Engine, a deputation was sent to the United States, the result being the adoption of a Worthington Duplex Pumping apparatus of a capacity of 8 million Imperial gallons. A contract was accordingly entered into with Mr. H. R. Worthington, of New York, for the sum of \$43,500.

Another contract for the building of the first section of the Aqueduct, with the still water basin, was awarded to Mr. John Donnelly, in December last.

The pipes for the new 30-inch pumping main have been contracted for by the Messrs. D. J. Stewart & Co., of Glasgow.

Arbitrators for the expropriation of the land for a large Storage Reservoir have been also appointed by the City Council. The work now under contract is only a small portion of the work embraced in the large scheme, and the rest is likely to be postponed for some years. As a great deal of land will yet be required for the proposed Works, I think I should fail in my duty if I did not urge strongly the importance of acquiring immediately all that is necessary to carry out the whole of the scheme. The experience of the last two years has demonstrated that the value of land in and about the city has more than doubled, and in many instances quadrupled. The time lost in settling on a scheme has already cost the city many thousand dollars. For instance, in the case of the large Storage Reservoir, land where the proposed site was decided on, selling two years ago for about \$1,000 per arpent, is now valued at above \$4,000. On this account no time should be lost in taking the necessary measures to secure the land wherever it is wanted, and to prosecute the work of making the new Aqueduct, in order

to save the construction of other auxiliary steam engines, and to stop the costly mode of supplying the water to the city by steam power. The heavy cost of this can be seen in this report, at page 10, where the comparative cost of pumping water by water and by steam power is given.

The bursting of one of the pumping mains this winter, has also rendered more patent the necessity of a large Storage Reservoir, where the supply of water for the city could be drawn, should the pumping works become disabled. The idea alone of the possibility of having the City without water, even for a few days, is quite sufficient to urge the City Council to lose no time in adopting the necessary steps to avoid such a calamity. What occurred last January, it is true, was not much felt by the public, but it is time that they should be aware now that another day more of stoppage of the pumping main would have seen the Reservoir quite empty, and the city totally at the mercy of the fire fiend. With this prospect nothing should abate the energy of the City Council, especially of the Water Committee, in prosecuting with vigor the contemplated improvements of the Water Works.

LOUIS LESAGE,

*Supt. of Water Works.*

MONTREAL, 30th March, 1874.

## INVENTORY of Stock on hand, January, 1874.

	36 in.	30 in.	24 in.	16 in.	12 in.	10 in.	8 in.	6 in.	4 in.	3 in.
Cast Iron Pipes in feet.....			175	540	281	1895	1710	1785	1656	700
Four Way Branches.....					6	10	4	14		
Three ".....					7	15	4	25	7	
Sleeves.....		5	14	8	9	19	1	4	2	9
Taper Pipes.....				1		10	2	15		
Elbows.....								8	9	
Double Bends.....								1	3	
Caps.....			1	4	1	1	4	2	7	10
Plugs.....				4	14	5	12	22	15	7
Valves.....			1	1	7	18	11	69	60	
Fork Pipes.....	2				2					

33 Pieces to raise Hydrants.  
 18 Seats for Hydrants.  
 18 Hydrant Covers.  
 13 Hydrant Frames  
 19 Valve Covers and Plugs.

18 Hydrant Posts.  
 398 Service Plates.  
 16-2 Nozzle Hydrants.  
 8-4 " "

## LEAD PIPE AND OTHER LEAD.

1,300 lbs. $\frac{1}{2}$ inch. Lead Pipe	2,000 lbs. Pig Lead
7,220 " $\frac{3}{8}$ " " "	60 " Block Tin
29 388 " 1 " " "	5 " Solder
883 " Scrap Lead	

 WORK SHOPS ON ST CHARLES BORROMÉE STREET  
 BRASS WORKS.

	DIAMETER.	1 in. x $\frac{1}{8}$	1 in. x $\frac{1}{2}$	$\frac{3}{4}$ in. x $\frac{1}{2}$	1 $\frac{1}{2}$ in.	1 in.	$\frac{3}{4}$ in.	$\frac{1}{2}$ in.
New Stop-Cocks with couplings.....						293	563	988
Old " " without ".....					16	22		
New Elbows with ".....						269	716	1559
Old " " without ".....					15	15	6	
Single Joints.....						247	663	101
Three Way Branches.....		12	22	433				
American Nozzler.....							36	

61 Brass Spindles  
 3 " Cut off  
 20 Hydrant Washers  
 24 " Nuts

102 Hydrant Nozzles  
 3 Feet Valves  
 753 lbs. Scrap-Brass

SCHEDULE showing the Monthly Average Pressure in the City Mains during the year 1873.

MONTH.	At Water Works Shop Lagauchetière Street corner of St. Charles Borromée Street.	Central Fire Station Craig Street.	Fire Station No. 2 St. Gabriel Street.	Fire Station No. 3 Wellington Street.	Fire Station No. 4 Chaboillez Square.	Fire Station No. 5 St. Catherine Street.	Fire Station No. 6 Ontario Street.	Fire Station No. 7 Dalhousie Square.	Fire Station No. 8 Craig Street.	Fire Station No. 9 Centre Street.
1873.										
February	63.00	70.00	50.00	.....	76.00	41.00	56.00	58.00	62.00	69.00
March	62.00	64.00	47.00	.....	72.00	38.00	51.00	55.00	60.00	66.00
April	63.00	72.00	52.00	70.00	77.00	41.00	58.00	57.00	64.00	73.00
May	62.00	74.00	52.00	72.00	77.00	42.00	60.00	61.00	.....	77.00
June	60.00	72.00	51.00	69.00	74.00	41.00	60.00	58.00	71.00	73.00
July	60.00	67.00	48.00	68.00	71.00	40.00	59.00	56.00	69.00	70.00
August	59.00	66.00	48.00	68.00	71.00	41.00	60.00	57.00	64.00	74.00
September	59.00	68.00	47.00	69.00	69.00	42.00	61.00	58.00	69.00	78.00
October	59.00	69.00	48.00	71.00	66.00	42.00	64.00	60.00	67.00	75.00
November	60.00	70.00	48.00	72.00	68.00	42.00	63.00	61.00	58.00	79.00
December	61.00	70.00	49.00	72.00	69.00	41.00	57.00	60.00	67.00	81.00
1874.										
January	63.00	70.00	50.00	72.00	68.00	40.00	54.00	58.00	65.00	81.00

SCHEDULE showing the number of assessed Dwellings, Stores, Shops, Offices  
Warehouses, Manufactories, Hotels, &c., in the City of Montreal,  
Year 1873-74, with the Assessed Water Rates thereon.

## DWELLINGS.

Number Assessed.	Tenanted	Vacant and not supplied.	Yearly Rate.	Number Assessed	Tenanted.	Vacant and not supplied.	Yearly Rate.
2,834	2,746	88	\$5.00	21,462	21,248	214	
3,528	3,493	35	5.75	87	87	....	\$28.25
3,360	3,336	24	6.50	14	14	....	29.00
2,361	2,347	14	7.25	87	87	....	29.75
1,234	1,231	3	8.00	2	2	....	30.50
1,237	1,226	11	8.75	26	26	....	31.25
589	586	3	9.50	171	169	2	32.75
1,163	1,154	9	10.25	19	19	....	34.25
64	64	....	11.00	1	1	....	35.00
807	799	8	11.75	22	22	....	35.75
61	61	....	12.50	46	46	....	36.50
440	438	2	13.25	7	7	....	37.25
201	199	2	14.00	2	2	....	38.75
494	492	2	14.75	1	1	....	39.50
8	8	....	15.50	104	102	2	40.25
341	338	3	16.25	1	1	....	41.75
13	13	....	17.00	7	7	....	44.00
473	466	7	17.75	1	1	....	45.50
4	4	....	18.50	55	54	1	47.75
173	173	....	19.25	6	6	....	51.50
9	8	1	20.00	24	24	....	55.25
328	328	....	20.75	2	2	....	59.00
16	16	....	21.50	19	18	1	62.75
162	162	....	22.25	1	1	....	66.50
3	3	....	23.00	4	4	....	70.25
158	158	....	23.75	22	22	....	77.75
282	280	2	25.25	13	13	....	92.75
119	119	....	26.75	1	1	....	452.75
21,462	21,248	214		22,207	21,987	220	

## SCHEDULE showing the number of Assessed Dwellings, &amp;c.—(Continued.)

## STORES, SHOPS, OFFICES, &amp;c.

Number Assessed.	Tenanted.	Vacant and not supplied.	Yearly Rate.	Number Assessed.	Tenanted.	Vacant and not supplied.	Yearly Rate.
387	357	30	\$ 4.00	3567	3401	166	
365	343	22	5.00	3	3	....	\$36.00
737	688	49	6.00	18	18	....	38.00
158	155	3	7.00	1	1	....	39.00
200	200	....	8.00	96	92	4	42.00
113	112	1	9.00	20	20	....	46.00
381	362	19	10.00	1	1	....	48.00
22	21	1	11.00	51	51	....	50.00
147	141	6	12.00	1	1	....	53.00
27	27	....	13.00	14	14	....	54.00
254	241	13	14.00	22	22	....	58.00
25	25	....	15.00	2	2	....	60.00
44	43	1	16.00	14	14	....	62.00
38	35	3	17.00	24	24	....	66.00
186	183	3	18.00	3	3	....	70.00
14	14	....	19.00	1	1	....	73.00
32	31	1	20.00	14	13	1	74.00
5	5	....	21.00	1	1	....	76.00
143	139	4	22.00	1	1	....	79.00
4	4	....	23.00	32	32	....	82.00
18	16	2	24.00	2	2	....	90.00
1	1	....	25.00	1	1	....	94.00
127	125	2	26.00	12	12	....	98.00
4	4	....	27.00	6	6	....	102.00
13	12	1	28.00	1	1	....	113.00
24	21	3	30.00	4	4	....	114.00
3	2	1	31.00	1	1	....	118.00
17	17	....	32.00	8	8	....	122.00
78	77	1	34 00	4	4	....	130.00
3567	3401	166		3925	3754	171	

## SCHEDULE showing the number of Assessed Dwellings, &amp;c., &amp;c.—(Continued)

## STORES, SHOPS, OFFICES, &amp;c.

Number Assessed.	Tenanted.	Vacant and not supplied.	Yearly Rate.	Number Assessed.	Tenanted.	Vacant and not supplied.	Yearly Rate.
3,925	3,754	171		3,941	3,770	171	
1	1	....	\$138.00	1	1	....	\$282.00
2	2	....	142.00	1	1	....	360.00
2	2	....	146.00	1	1	....	362.00
5	5	....	162.00	1	1	....	382.00
1	1	....	194.00	2	2	....	482.00
1	1	....	202.00	1	1	....	562.00
3	3	....	242.00	2	....	....	642.00
1	1	....	258.00	....	....	....	
3,941	3,770	171		3,950	3,779	171	

## HOTELS AND TAVERNS.

Number Assessed.	Yearly Rate.	Number Assessed.	Yearly Rate.	Number Assessed.	Yearly Rate.
140	\$12.00	271		295	
27	17.00	10	\$52.00	1	\$202.00
50	22.00	7	62.00	1	252.00
24	27.00	1	72.00	1	262.00
5	32.00	1	77.00	1	552.00
12	37.00	2	82.00	1	622.00
12	42.00	2	102.00	....	
1	47.00	1	122.00	....	
271		295		300	

HORSES.		COWS.		URINALS.	CLOSETS.		HORSE STALLS.	
No.	Rate.	No.	Rate.		No.	Rate.	No.	Rate.
2,949	\$2.00	513	\$1.00	359	428	\$3.00	699	\$1.00
					4,263	4.00	297	2.00
					86	15.00		
2,949		513		359	4,777		996	

SCHEDULE showing the number of Assessed Dwellings, &c.—(Continued.)

SPECIAL RATES.

BAKERIES.		BEER BOTTLERS.		BREWERIES.		FOUNTAINS.		FACORIES.		STEAM ENGINES.			SUNDRIES.	
No.	Rate.	No.	Rate.	No.	Rate.	No.	Rate.	No.	Rate.	No.	Power.	Total.	No.	Rate.
1	\$2.00	1	\$4.00	1	\$21.00	1	\$3.00	6	\$10.00	5	1	5	4	\$5.00
1	5.00	1	5.00	1	30.00	16	5.00	4	15.00	1	1 1/2	1 1/2	1	6.00
2	6.00	1	6.00	1	60.00	1	6.00	2	20.00	16	2	32	1	10.00
2	9.00	2	8.00	1	80.00	2	7.50	1	22.50	10	3	30	1	12.00
5	10.00	5	10.00	1	90.00	1	8.00	3	25.00	18	4	72	4	15.00
1	12.00	3	12.00	2	400.00	1	9.00	5	30.00	13	5	65	1	17.00
4	15.00	1	14.00			2	10.00	6	40.00	16	6	96	1	24.00
9	20.00	2	15.00			1	12.00	1	54.00	5	7	35	1	25.00
1	21.00	1	24.00			2	15.00	2	60.00	11	8	88	1	30.00
1	25.00	1	25.00			1		1	90.00	3	9	27	1	42.00
4	30.00							1	400.00	10	10	100	3	50.00
1	35.00									4	12	48	1	60.00
1	37.50									1	14	14		
1	40.00									1	15	15		
2	50.00									1	16	16		
										5	20	100		
										1	30	30		
37		18		7		27		32		121		784 1/2	20	



Grand Trunk Railway Company Point St. Charles .....	\$3336.00
Montreal Jail .....	750.00
Court House .....	600.00
Grand Trunk Railway Company Bonaventure Street .....	544.00
Gas Works Ottawa Street .....	300.00

There are 37 water meters owned by water Consumers and 26 the property of the Corporation now in use.

#### RECAPITULATION.

	Tenanted.	Vacant.	Total.
Dwellings .....	21,987	220	22,207
Stores, Shops, Offices .....	3,779	171	3,950
Hotels and Taverns .....	300		300
	<hr/> 26,066	<hr/> 391	<hr/> 26,457

Engines .....	121
Special charges on Manufactories .....	141
Horse Stalls .....	996
Water Closets .....	4,777
Urinals .....	359
Horses .....	2,949
Cows .....	513

Cash Receipts by the Water Works Dpartment during the Civic Year,  
ending the 31st. January 1874.

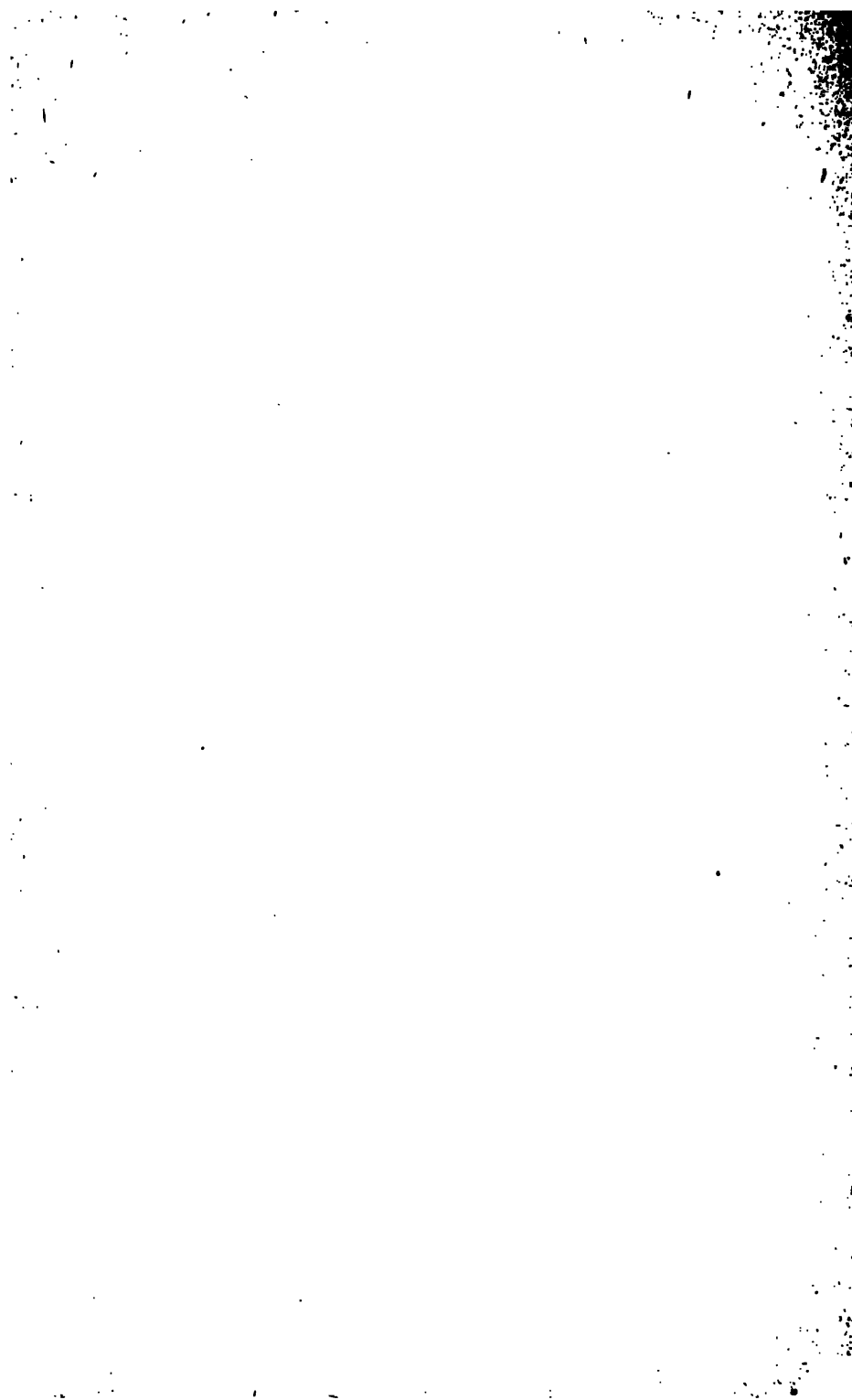
Assessed Water Rates on Buildings .....	\$239,174.52
"    "    "    " Water Closets .....	17,567.00
"    "    "    " Urinals .....	480.50
"    "    "    " Horses .....	5,300.00
"    "    "    " Cows .....	498.00
"    "    "    " Horse Stalls .....	1,274.00
From Tenants outside the City Limits .....	3,661.76
" Taps .....	281.80
" Steam Engines supplied through meters ...	1,725.41
" Permits for Hoses to water streets &c .....	238.00
" Permits for Building Purposes .....	1,878.52
Carried forward .....	<hr/> 272,079.51

**Cash Receipts by the Water Works Department during the Civic Year,  
ending the 31st January 1874.—(Continued)**

Brought forward .....	272,079.51	
" Private Fountains .....	183.00	
" Steam Engines charged at tariff Rates .....	5,477.50	
" Bakeries .....	850.00	
" Breweries .....	1,081.00	
" Sundries .....	2,255.40	
	<hr/>	
	\$281,926.41	
Arrears .....	12,581.87	294,508.28
	<hr/>	
Job Ledger accounts		1,937.34
		<hr/>
		\$296,445.62
Water Rates collected in 1873 .....	\$294,508.28	
" " " " 1872 .....	264,173.58	
	<hr/>	
Increase .....	\$30,334.70	

CHAS. LAPIERRE,

*Accountant M. W. W.*



ANNUAL REPORT  
OF THE  
SUPERINTENDENT  
OF THE  
MONTREAL WATER WORKS  
FOR THE  
*YEAR ENDING 31<sup>ST</sup> DECEMBER, 1875.*

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Printed by Order of the Water Committee.



Montreal :

LOUIS PERBAULT & Co., CITY PRINTERS, 87 ST. JAMES STREETS

1876

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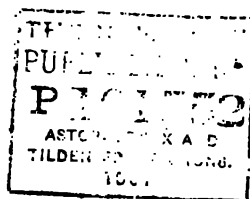


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ANNUAL REPORT  
OF THE  
SUPERINTENDENT OF THE MONTREAL  
WATER WORKS,  
FOR THE YEAR ENDING 31ST DECEMBER, 1875.

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*To the Mayor and Citizens of the City of Montreal.*

GENTLEMEN,—The following Report upon the condition of the Montreal Water Works, for the year ending December 31st, 1875, is respectfully submitted.

AQUEDUCT.

The usual repairs to the fences, bridges, and embankments of the aqueduct have been made, but the cleaning of the aqueduct which was begun two years ago has been necessarily postponed, awaiting a fitting opportunity to proceed with it.

The necessary works to be done this year will be the cleaning of some of the ditches along the line of Dumberry's and Crawford's farms, and the renewing of the Stop Gates Bridge at the Rock Cut.

The embankment at the proposed connection of the New Cut with the present Aqueduct requires also to be protected and made stronger. If possible, also, the cleaning above referred to should be continued as far as the Stop Gates at the Rock Cut. The section of the Aqueduct below these gates being lined with dry stone walls, has been more or less damaged by the ice carrying down to the bottom of the Cut a quantity of the stone lining. The work of clearing the prism of the Aqueduct of loose stones



thus detached by the ice has been carried on from year to year (except last year), and should be continued as circumstances may permit, until the whole has been cleared.

#### PUMPING WORKS—BUILDINGS AND MACHINERY.

The houses and grounds have been kept in good repair. The Wheel House, principally the portion occupied by the Turbine Wheel No. 1, had a new flooring all through, and the railing of the gallery replaced by an iron one similar to that of the Breast Wheel building; and all the interior of this last was re-painted and varnished.

The roof of the old Engine House will require re-painting. The railings in front of the Wheel House have been renewed and painted. A small stable at the back of the mens' dwellings was destroyed by fire last summer, and rebuilt by our own men with timber furnished by the Department.

The machinery has undergone the following repairs:—

The two valve chests of Turbine No. 1, which have been split and leaking for some years past, were replaced by new and stronger ones. The large spur-wheel recoged, and the bevel wheel replaced by a more substantial one. The journals of the counter-shafts turned anew. The babbit metal in the boxes removed from the pillow-blocks, and replaced by brass collars. The pins of the crank-wheels re-adjusted, and one of them replaced by a steel one; and the pump valves re-faced and made perfectly tight. The cross-head and guides, which have given some trouble from the beginning, were altered and replaced by more substantial ones. The two pump cylinders, which were worn oval, were re-bored, and provided with new pistons and brass followers. The pedestal of the Turbine shaft was also re lined with babbit metal; and, in fine, all other minor repairs were made to render this portion of the work as perfect as may be.

This work was accomplished between October, 1874, and February, 1875.

One of the pump cylinders, after being repaired and put to work, gave way on the 19th April last, and was found to have split from not having been properly re-bored, but was subsequently made secure by iron bands shrunk over it. The valve chest, covers and bonnets, are leaking through their joints; but this defect can be remedied either by having stronger covers made, or by forming better joints. Apart from this, this portion of the machinery is in good order, and will not require any repairs during this year.

The Turbine Wheel No. 2, erected to replace one of the Breast Wheels, is in good condition, and has proved an efficient piece of machinery, not having cost one cent for repairs during the year. The old pumps to which this wheel was attached have had their plunger rods and brasses re-adjusted. These pumps, like those of the Breast Wheels (which have been in use since the beginning of the works), are not very well secured to their foundations (some of the tying-bolts having got loose), and will require some other means to secure them.

The old Breast Wheel is in good working order, but the pumps require some repairs, as well as the brasses of the connecting rods.

The bilge pump used to drain the pump pits has also been repaired, by replacing the two valve chests, and is rendered efficient for some time to come.

The Steam Pumping Machinery is as follows :—

No. 1 Engine is in as good order as can be expected. The pumps, valve chests, and all the work called for in the contract, to renew and alter these pumps, were strictly carried out; but on account of the delicacy and disproportion of the framing of this engine, very little reliance can be placed on her; and when the requirements of the service are such that the work of this engine should be continuous, she should be replaced by a Worthington Duplex, similar to the one now in use at the works.

Engine No. 2 is now in good working order, although, like No. 1, not very much used. This engine, by the breaking of her crank-shaft, was disabled from August to November during which time a substantial shaft was put in, and all other damages repaired. This engine is more reliable than No. 1, and, with proper handling, may be of good service, although she will always be expensive in fuel.

The Worthington Engine has been on duty most of the time since it was started in January, 1875, and has given perfect satisfaction, requiring hardly any repairs of a nature to cause serious delay. This machine, like all the other machines on the work, should have an automatic air-pump attached to its air-vessel, in order that the latter may be filled with air without the inconvenience of stopping the operation of the engine for that purpose, as is now necessary.

The Cornish Boilers are in good condition. There are, however, two slight cracks in one of the flues, and a small scale in another, but of such a trifling nature as scarcely to deserve notice. The only repairs done to these boilers was removing three or four rivets. All their mountings and connections, including steam pipes and valves, are perfect and tight.

During the past year, the Tubular Boilers (especially the four first set in), underwent considerable repairs, a fact not at all surprising when it is understood that for years they were required to work at 100 per cent. over and above their nominal horse-power. These boilers require very careful handling, and cannot be called on to perform a continuous duty. Therefore, in view of the increased demand for water, the time has come when more steam-power is absolutely required, and a further addition of boiler power must be provided for the winter of 1876-77; and as there is just room for four more boilers in the old coal shed, I would recommend that it be utilized by the erection of four boilers on the same principle as those last erected.

During last summer, all the steam pipes, valves and connections of the Tubular Boilers were overhauled, and all the joints re-made; the iron valve spindles injuriously affecting the packing were replaced by brass ones, and they are all in a satisfactory condition.

The four 24-inch valves on the Rising Main at the Engine-house received all the necessary repairs, and each has been provided with a 2-inch equilibrium valve. There have also been added three hydrants for the protection of the building against fire, making now in all five hydrants.

The new Machine Shop, which was erected in 1874, over the sluices of the waste-weir, has already proved a great acquisition to the works—all the repairs of last year having been performed by our own hands. This shop is now provided with the following tools, viz:—one engine lathe, 14 ft. centre and 26" swing; one do., 7 ft. centre and 20" swing; one do., 3 ft. centre and 17" swing; one planer, 6 ft. bed; one shaper, 10" stroke; one vertical driller; one bolt cutter, from 1½" down; one wood lathe, 4 ft. centre; one blacksmith's bellows and hearth, one grind stone. The whole of which is driven by a 12 H.P. turbine, shafting and pullies, &c. There is also a complete sett of special machine and hand tools for the proper carrying out of the work of the department. A brass foundry has also been erected in the old blacksmith's shop, where all our brass work for repairs and new works can now be made. It is of great benefit to the Department to have under its control all the means and appliances for making its own repairs, without being obliged to have recourse to the machine shops of the City, which, on account of their distance from the works, have in the past been a source of annoyance, delay and expense. Another advantage resulting to the Department from the possession of these workshops, is the ability to keep constantly employed the various hands composing the large staff requisite to work the different classes of pumping machin-

ery, which have to be attended alternately at different seasons as occasion may require.

A new coal shed, of 200 feet long by 150 feet wide, capable of holding 4,000 tons of coal, has been erected at the south-west side of the Worthington Engine-house, but separated from it by a distance of 50 feet, and a strong brick gable end wall, as a cut off from fire should it originate in the coal shed.

The shed is provided with proper gangways, supported on cast-iron columns, and is properly ventilated. Five lines of tramway run the whole length of the shed, and communicate with the boiler-house by another tramway with which they are connected—the whole provided with proper turn-tables and weighing scale. Trucks adapted to these tramways are employed to bring the coal from the shed to the boiler-house. By these means, two men now perform the same work which formerly required six men and two horses.

The building was erected by Jas. Sheridan, contractor and builder, and the contract was satisfactorily performed. The Schedules Nos. 1 and 2 in the Appendix. shew that the quantity of water pumped during the year by the Water Wheels has been—

Breast Wheel.....	428,435,432 gallons.
Turbines Nos. 1 and 2.....	1,451,121,365     “

Making a total of.... 1,879,556,797 gallons.

And the expenditure for the Wheel House proper, as per detailed statement of Schedule No. 1, has been \$6,437 30, making the cost per million gallons raised 165 feet high \$3 42 nearly, or one million of gallons raised 1 foot high a little over 2 cents.

The quantity of water pumped by the Steam Engines during the year, as per Schedule No. 3, is as follows:—

Engine No. 1.....	19,963,062 gallons,
Engine No. 2.....	182,081,426     “
Engine No. 3.....	1,124,423,944     “

Making a total of..... 1,326,468,432 gallons.

And the expenditure under this head has been, as per detailed statement of Schedule No. 3, \$36,058 01, or one million of gallons raised 165 feet high at a little over 11 $\frac{1}{2}$  cents.

The expenditure on pumping compared with that of 1874, shows a great reduction :

	By Water Power.	By Steam.
Cost of raising one million ) 1874..\$0 03 $\frac{1}{2}$		\$0 23
gallons 1 foot high ..... ) 1875.. 0 02		0 11 $\frac{1}{2}$

Making 30 per cent. less for water power, and 49 per cent. less for steam. This reduction is greatly due to the more perfect engines and the addition of a new 30 inch main, which has considerably decreased the pressure of water on the pumps. This result has amply fulfilled the hope I expressed on this subject in my last year's report.

A question having been raised in the Water Committee about the efficiency of the pumping machinery, two mechanical engineers from the Grand Trunk Railway Co. (Messrs. Blackwell and Burnett) were appointed to inspect the works and report thereon. Their report is hereto appended.

#### TAIL RACE AND PUMPING MAIN.

The Tail Race is in the same condition as it was in last year. The damage caused by the washing of the bank, at the discharge in the river, is still going on. Steps should be taken to remedy this. Apart from this, nothing more will be required for this portion of the work.

The necessary cleaning and repairing of the valves and valve chambers has been performed, and the mains are all in good order. In January, 1875, several bursts occurred simultaneously on the pumping mains, viz :—on the new 30 inch main on the north side of, and near the Lachine Canal, and two others on St. Catherine Street, on the No. 2—24 inch pumping main. The most plausible explanation is that the break on the 30 inch main must have occurred first, and the sudden shutting off of the check valves at Moffat's Hill, which were suddenly relieved from the

pressure below them by the burst, caused the column of water above them to come to a too sudden rest, and to recoil against the sides of the pipes in places where air might have been lodged, and ruptured them. This 30 inch main had only been in use for a few days.) The accident caused damage in some of the houses in St. Catherine Street and vicinity.

#### RESERVOIRS.

The dry-stone wall at the foot of the eastern embankment of the MacTavish Street Reservoir was repaired only last spring. The Reservoir walls, which were leaking at several places at the water-line, were re-pointed with hydraulic lime. For the present, and until the work of the extension is completed, it will not be possible to keep the grounds surrounding this Reservoir in anything like proper order. Suffice it to say, that every precaution is taken to protect its water from contamination or pollution of any kind. The valves and valve house are in good order.

The Old Reservoir at Coteau Basin is always kept shut, and has not been used during the year. Some slight repairs were done to the fences.

The Upper Level Reservoir has been in operation only a few months, and gives good satisfaction. The small pumping engine erected at the MacTavish Street Reservoir is doing its work well, and gives the water supply for the high service. This engine was started in October last, and has pumped up to last January 5,678,916 gallons.

#### REPAIRS TO DISTRIBUTION AND SERVICE PIPES.

The repairs to distribution and service pipes form, as usual, a heavy item in the expenditure of the Department. The casualties on the mains (as seen in Schedule 8) have been 13 broken pipes and 38 leaks from joints. In some cases these occurred with damage to adjoining property. The faults on service pipes have been numerous, and due to various causes. In many instances these pipes were

frozen during last winter ; in other cases, the boxes over the stop-cocks have been displaced by the frost, or filled with stones or gravel, by the frequent disturbance of the footpaths. This filling of the boxes is also frequently met with in cases where the water has to be turned off from defaulting tenants, inducing the suspicion of desiring on their part to retard or prevent the cutting off of their supply. The frozen service pipes have been more numerous this past year than any year we have previously experienced. The number has been 520 service pipes, which had for the most part to be dug up. The frost was invariably found to have been from 5 to 6 feet deep. Many of those pipes taken up were sunk deeper, but those in the rock excavation above Sherbrooke Street had to be protected with ashes. Profiting by this experience, I have established a rule to put these pipes deeper for the future. There have been also 714 service pipes found frozen in the walls, caused by cold cellars and neglect of tenants. Our plumbers were called out 1,396 times during the last winter.

All the street valves are in pretty good condition. In nearly all of them, brass spindles have been substituted for the iron ones used in past years.

Keeping the Fire Hydrants in order is also a matter of great expense. These have increased in number from year to year, and for this reason, require a large staff to look after them. The total number of hydrants found frozen during last winter, 1875-76, was 295. The frequency of this occurrence has induced me to try different kinds of hydrants with the view of ascertaining which best answers our requirements. I find that in use in Philadelphia (with some modifications) is best adapted to stand the cold, and costs less than our own. I have therefore decided to introduce it next summer.

The By-Law prohibiting the use of Fire Hydrants without proper authority is violated so frequently that it becomes necessary that a more stringent supervision should be exercised ; and for this reason I would suggest



that all our men employed at visiting these hydrants, as well as all inspectors, valve-men and turn-cocks, be sworn as policemen, and furnished with proper badges, and be invested with authority to arrest any party found violating any of the By-Laws for the protection of the Water Works. The carrying out of this suggestion would prevent a good deal of mischief and save much expense.

#### WORK-SHOP.

The Work shop still remains in its dilapidated state, and nothing has been done to it. The dwelling and office, which up to last year were occupied by the foreman of the works, having become uninhabitable, a lodging was procured for him close to the work, and a portion of the same building was converted into a store-room, where the stores are better kept under the control of the clerk attending the office.

Since the introduction on the works of pipes of 30 inch diam., a difficulty in testing has arisen—the hydraulic press heretofore in use for the purpose being too small for the larger castings, a new machine for the purpose was contracted for by Mr. Chanteloup, of this city, and will be ready for use early next spring.

#### CONSUMPTION OF WATER.

Schedule No. 7 in the Appendix gives the average daily consumption of water for each month since 1866. The figures for 1875 give the daily average for the whole year at 8,785,217 gallons, being 575,809 above the average of last year. In this are included about 2,081,000 gallons for fire purposes, 27,750,000 for watering the streets, and 286,000 gallons for flushing sewers and sinks. The increase of the daily average for 1875 is a good deal less than that of 1874 over the previous year (which was 809,512 gallons). The above figures give for a population of 140,000 inhabitants a consumption of about 62 gallons *per capita*. This consumption of water, although increasing

in a less proportion than that of the previous year, is nevertheless alarmingly large: and a great deal, if not half, of this water is due to reckless waste. This complaint is that of every large City of the United States, and every Water Board is engaged in the endeavour to discover some means to put a stop to this waste. A general use of water meters appears to be the most effectual mode of checking it, but the difficulties attending this system are numerous. The climate of our city presents one of the most serious difficulties in the way of using meters, unless some easy mode of protecting them from frost be found. Even under existing circumstances, however, the few which have been introduced here have already more than repaid the original outlay on them.

#### WATER METERS.

The total number of Water Meters in operation in the Department is 294, of which 233 belong to the City and 61 to private parties. There are besides at the work-shop 46 meters, of which 33 are in good order, and 13 rendered useless by frost or by defect in their construction.

Every meter has a brass plate attached to it, bearing its number, which is also registered in a book, in which are recorded the time the meter has been in use, and the different repairs done to each.

During the year several experiments were made to test the accuracy of the different kinds of meters used by the Department, and the result has been in favor of those called the "Union" and the Worthington Piston Meter. In the experience of several years, these last-named meters have proved the most correct, and least subject to get out of order; but, on the other hand, they are not constructed to deliver the water as freely as a pipe of the same diameter. This inconvenience is particularly felt where the full quantity of water due to the size of the pipe is required instantaneously, as in the case of hydraulic engines, or of fire—for which cases the rotatory meters, although not so correct in measurement, are preferable. Amongst these the

"Gem" meter possesses this free delivery of the water to a greater degree than the first-named, but it lacks accuracy if the stream of water used is less than the capacity of the meter could allow; so that in establishments using a larger service pipe than the ordinary requirements of the business, but when such large pipe is nevertheless needed for fire protection or otherwise, it often happens that the quantity of water registered by the meter falls considerably short of the actual quantity used.

Until inventors shall have produced an instrument which shall combine all these requisites, viz., correctness, free delivery, durability and cheapness, it will not be advisable to have them introduced generally in our Department. Several inventors are in the field, and I hope to see more progress in this line of business, as it is ardently looked to as a means of preventing such enormous expenditures which cities are now obliged to incur for Water Works purposes.

## NEW WORKS AND THEIR PROGRESS.

## NEW AQUEDUCT.

The progress of this work under the contractor, Mr. John Donnelly, is stated at full length in the report of Mr. B. D. McConnell, Resident Engineer, which is hereto appended. There is at present about 40 per cent. of the excavation of this work remaining to be done, also a good deal of crib-work, and all the masonry except about one-fourth of the slope walls.

At the end of the season, the contractor finding himself unable to finish his work in time, or without assistance, stopped work in December last, and came before the Water Committee for relief, on the plea of extraordinary difficulties in contending with water from the numerous springs met with, and also on account of the very low price for the work. After having heard the demand of Mr. Donnelly (who declared that without an advance of \$115,000.00 he should be unable to carry his work to completion), the Water Committee did not feel justified in acceding to it, but were willing to grant an extension of time. This not satisfying Mr. Donnelly, the Committee, with the sanction of the Council, and by the advice of the City Attorney, corroborated by that of two eminent lawyers, cancelled Mr. Donnelly's contract. This gentleman and his securities were duly put *en demeure*. New plans and specifications were prepared and tenders solicited in December last for the completion of the works. Six tenders were received, and that of Messrs. F. B. McNamee & Co. being the lowest, was accepted, and the contract awarded to that firm.

The entrance to the old Aqueduct has been provided with stop-gates, made under contract by Messrs W. P. Bartley & Co.

The masonry to receive these gates were built, under contract, by John Donnelly.

The floating gates for the entrance of the New Aqueduct were undertaken by A. Cantin, ship-builder, and are to be delivered in the course of next summer. The work is at present nearly completed in Mr. Cantin's yard.

Plans for the expropriation of the necessary land for the completion of the scheme of the New Aqueduct, have been prepared, and offers made to some of the proprietors along the line, but nothing definite has yet been accomplished.

#### MCTAVISH STREET RESERVOIR EXTENSION.

This work, undertaken by Messrs. J. Whelan & Co., has progressed satisfactorily, and the contractors have shown such skill and ability as to remove any doubt of their completing the work in time.

There are at present 55,000 cubic yards of rock excavated. This rock, after having been broken to the size for macadamizing, is weighed on the spot, and then carted directly to, and spread on, the street where it is to be used. By the old system, the broken stones were carted to certain depots throughout the city, where they were piled for measurement, and from which they were afterwards carted to, and spread on, the streets where required. Evidently by the new system, the Corporation is benefitted to the extent of the cost of one cartage and the piling, less a small additional price per cubic yard paid the contractor for weighing. Besides which, weighing is a more accurate mode of ascertaining the quantity received than measuring. The additional price was established by the City Surveyor and myself, after mature deliberation, and with the sanction of the Water Committee. The rock excavation is more than half finished.

The Pier in front of the valve-house has been taken down, and rebuilt in substantial masonry, with hydraulic mortar.

#### HIGH LEVEL RESERVOIR.

The High Level Reservoir contracted for by the Messrs. J. Whelan & Co., has been satisfactorily completed, and was filled with water in October last. On account of the nature of the rock met with, and to secure a tight bottom, this work had to be enlarged to

nearly double the capacity originally intended. It now measures 200 feet long by 100 feet broad, with a depth of 14 feet, and is at an elevation of 219 feet above the McTavish Street Reservoir. Its capacity is nearly two million gallons. This Reservoir is now supplying all that section of the city north of Sherbrooke and west of McTavish Street, and Sherbrooke Street itself, west of Mountain.

The Engine-house was built at the McTavish Street Reservoir, in connection with the Keeper's house, which was also remodelled to suit the new building. The whole work was done under the immediate control of the Department, and presents a fine appearance, with its Mansard roof and octagonal chimney. The engine is a Worthington duplex high pressure, of about 24 horse-power, and was contracted for, with boiler, piping, valves, &c., all inside the building, by H. R. Worthington, who has given entire and full satisfaction. This engine was started on the 5th of October last, and has since performed its duty very well.

The Pumping Main is a 12-inch pipe, extending from the Engine-house to the Upper Reservoir, *via* McTavish Street to Pine Avenue, westward through Pine Avenue to Peel Street, and thence along the western side of Sir Hugh Allan's wall to the Reservoir.

The distribution from this main is by a line of 12-inch pipe along the proposed continuation of Pine Avenue, from Peel Street to Côte des Neiges Road, and connecting with 4-inch pipes extending towards Sherbrooke Street, on Peel, Drummond, Redpath and Simpson Streets. From Pine Avenue up Côte des Neiges Road, the 12-inch pipe continues as far as the residence of Alderman McCord, and downwards from Pine Avenue to Sherbrooke Street is a 6-inch pipe. Hydrants and stop-valves have also been distributed over all that section. A portion of the 12-inch main in Pine Avenue has, however, yet to be laid, namely, from the Mount Royal Park to Côte des Neiges Road, a distance of about 600 feet. Eastward from McTavish Street, on Pine Avenue, the 12-inch main is laid as far as the property of the Estate Frothingham.

All this work is very costly, being in rock excavation; but as it

can be done at any season, advantage has been taken of the low rate of wages prevailing this winter, to proceed with it, thereby effecting a saving to the Corporation, and at the same time affording employment to many persons who otherwise would have been in great want.

### 30-INCH PUMPING MAIN.

During last winter this Main was continued on Atwater Avenue, from St. Joseph Street to St. Antoine, passing through the Tanneries Swamp, where a great deal of water was met; but by the help of steam pumps, the work was pushed through satisfactorily, so that by the early spring the main had been laid nearly to Dorchester Street. Since then the work has progressed, and the pipe is now laid through the whole length of Atwater Avenue to Sherbrooke Street (connecting at its crossing with the St. Catherine Street 12-inch main), through Sherbrooke eastwards to the crossing of the two 24-inch pumping mains at McGill College Avenue (with each of which a connection is made, with proper stop-valves). It thence continues as far as Logan's Farm, connecting on its route with all the mains of the cross streets, which mains it assists, by furnishing a large body of water to all the eastern portion of the city. The total length of 30-inch pipe now laid from St. Joseph Street to McGill College Avenue is 10,208 feet; and from McGill College Avenue to Logan's farm is 6,992 feet.

The work of laying this pipe has been carried on all through the present winter; and owing to the reduced rate of wages, has cost no more than the summer work.

I would here remark, that though this work requires to be well done, and that, on that account, it has been deemed advisable for the Department to have it done by day's work, I have come to the conclusion, from the experience of last summer, that works of such magnitude may be *well* done by contract, and at a much cheaper rate than by day's labour; and, in future, I would recommend that tenders should be invited for such work. These remarks do not apply to the laying of service pipes or small main pipes, both of which I find may be done more cheaply by day's work than by contract.

The total length of Main Pipes laid in the city during the year 1875 (as seen in Schedule No. 10), amounts to 49,860 lineal feet, viz:—17,200 feet of 30-inch cast iron pipes, 4,519 feet of 12-inch, 4,999 feet of 10-inch, 10,059 feet of 6-inch, 11,763 feet of 4-inch, and 120 feet of 3-inch. 764 feet of 1½-inch vulcanized rubber coated iron pipes, and 436 feet of inch lead pipe; 3 stop-cocks of 30-inch, 2 of 24-inch, 11 of 12-inch, 4 of 10-inch, 25 of 6-inch, 21 of 4-inch, and 48 Fire Hydrants; also, 1,729 service pipes.

The total length of Cast Iron Pipes laid in the city up to date is 21,000 feet of 30-inch, 27,666 feet of 24-inch, 2,650 feet of 16-inch, 20,763 feet of 12-inch, 57,525 feet of 10-inch, 7,968 feet of 8-inch, 190,981 feet of 6-inch, 315,002 feet of 4-inch, 302 feet of 3-inch, and 7,792 feet of smaller main pipes; making a total length of 651,649 lineal feet of main pipes, or 123.42 miles.

There are now laid 8 stop-cocks of 30-inch, 25 of 24-inch, 3 of 16-inch, 33 of 12-inch, 56 of 10-inch, 9 of 8-inch, 231 of 6-inch, 485 of 4-inch, and 32 of 2½-inch; making a total of 868 stop-cocks. There are 780 Fire Hydrants, including 37 private ones.

The total number of houses supplied with water is 21,573.

The contract for Cast Iron Pipes this year has been awarded to the firm of Szarbinowski and Nathan, of Manchester, England; and that for the special castings to Messrs. W. P. Bartley & Co. That for the lead pipes to the Montreal Rolling Mill Co.; and for pig lead to Messrs. MacPherson & Bellhouse.

The contracts for last year, viz., with Messrs. MacLaren & Co., for cast iron pipes; with Mr. J. MacDougal, for valves and special castings, as well as those for lead pipes and pig lead have been duly fulfilled.

#### FILTERING BEDS.

At the suggestion of some members of the Water Committee, regarding the question of the water supply from a sanitary point of view, and enquiring as to the best means of rendering pure and wholesome the water consumed by the citizens, I was directed to study the question



of filtering basins, and to prepare plans, with estimates of the probable cost, of the best system of filtering as applied to our works. I have since given the subject my attention.

The water used by the city, taken from the River St. Lawrence, is in the spring of the year rendered a little muddy by the freshets occasioned by the melting of the snow, and would require, particularly at that time, to be allowed to settle for a few days before being admitted to the pumps; and I am of the opinion that the construction of a large settling basin near the Wheel House would be all that would be required for the present.

The use of filtering beds, although very general in Europe, is in America very limited. I am aware of only a few places where such artificial beds are used in the United States. A few years ago, the City of St. Louis commissioned J. P. Kirkwood, Esq., a celebrated hydraulic engineer, of Brooklyn, to visit the principal places in Europe where the system of filtration is in use, and to report the result of his observations. It is from the information thus obtained by him that I have studied this question. So far, I am not aware that the City of St. Louis has done any work of the kind.

I herewith submit a description and estimate of a plan which I think would be applicable to our city, should necessity compel us to have recourse to it. It is based upon the same data as those adopted for the City of Liverpool, which data are furnished in the report of Mr. Kirkwood.

From his observations, it is seen that the general practice allowed is about 3 gallons per hour for each square foot of filter beds; and the area of these beds is so divided that one of the divisions may be at rest to allow of its being cleaned. The area of these beds for a delivery of 15 millions of gallons per 24 hours, at the velocity above quoted, would be about 180,000 square feet; this divided into four compartments, would make an area of 45,000 square feet, or a basin of  $300 \times 150$  feet, and each of a capacity of 3,750,000 gallons per 24 hours. The basins here proposed are to be 14 feet deep, built all round with substantial stone walls. These walls are built nearly per-

pendicular, as those in Berlin and Altona, in Germany, instead of with a slope, as in England (notably at Liverpool). The perpendicular wall is considered as best suited to a climate such as that of Canada. The filtering material is 7 feet 3 inches deep, and made up as follows:—

- 30 inches of fine clear river sand.
- 6 inches of coarse river sand.
- 6 inches of  $\frac{1}{4}$ -inch gravel.
- 6 inches of  $\frac{1}{2}$ -inch gravel.
- 6 inches of 1-inch gravel.
- 9 inches of 2-inch broken stones.
- 24 inches of 4 to 8-inch fragments of stones.

The fragments rest upon a concrete floor of 6 inches in thickness, having a slight inclination towards two lines dividing these basins longitudinally, and these lines towards the outlet where they unite. Along these lines run two openly laid stone culverts, 18 × 24 inches, which unite in a cast iron pipe under the front wall, communicating with the clear water well.

The water is to be admitted to these basins from a large receiving reservoir at the back of the filter beds, and flows over upon the sand, sinking slowly through it and the other filtering materials, and leaving its filth upon the surface of the sand, is gathered by the stone culverts above referred to and conducted to the clear water wells, in which it rises to the level of the water in the beds, and thence passes over a gate or weir, where it is measured, and its flow regulated by the raising or lowering of the gate by means of proper appliances, and thence passes into the main supply pipe to the pumps. Over each of the wells is constructed a gate-house, in which is enclosed all the machinery for gauging and regulating the flow of water.

The severity of our winter renders it necessary to have a large area of sand beds, sufficient to filter all the water required during the time they will be covered with ice, as it will then be difficult to clean them. This difficulty might be obviated by protecting the basins from frost by an artificial covering, but the expense of such a plan renders it impracticable.

For this reason, and to avoid the frequent cleaning of the beds, it is important that the water, before being admitted into the filtering basins, should be allowed to settle for a few hours in a gathering reservoir. Fortunately, the winter is the season when our water is the purest, and consequently, when the cleaning of the beds will be least required.

The cleaning which has to be done from time to time, and the frequency of which, experience alone can dictate, is performed as follows:—The water of the basin to be cleaned is first lowered to about 12 to 18 inches below the sand bed, and then a thin coating of about  $\frac{5}{8}$  of an inch of the upper surface of the sand is removed with flat shovels, by ordinary labourers. This coating is ordinarily found sufficient to remove all the filth gathered on the bed. This dirty sand is wheeled in barrows from the basin to the deposit ground, where it is to be washed for future use, if this process is found to be less costly than replacing it by new sand. At each cleaning of the filter bed, the sand has to be loosened by forks for some 6 to 8 inches in depth, and afterwards raked smoothly over; because this sand is liable to pack close if the cleaning is too long delayed, and may occasion the destruction of the bed, by a too great pressure of water resting on, instead of going through a bed so packed. This cleaning may be repeated from time to time, until the sand bed has been reduced to 8 or 10 inches, without adding new or clean sand at each time.

I herewith submit an estimate of the probable cost of four filtering basins, capable of filtering each 3,750,000 gallons per 24 hours.

#### COST OF ONE BASIN.

Filter Basin, 300 feet $\times$ 150 feet.....	\$92,872 00
Valve house .. .. .	6,729 00
Superstructure .. . . .	2,586 00
Well and Inlet Pipe .. . . .	1,322 00
Piping.....	3,987 00
Total for One Basin.....	<u>\$107,496 00</u>
Do Four Basins .. . . .	<u>\$429,984 00</u>

To which must be added—

Octagon Well .....	4,923 00
Superstructure .....	2,893 00
Piping to the Pumps.....	3,016 00
Total.....	<u>\$440,825 00</u>

Now, as to the cost of maintaining these filters in proper operation, I have to say, that I am not in possession of sufficient information to give very correct figures; and I have to gather from Mr. Kirkwood the cost of such work in Liverpool, which is laid down at £100 sterling per annum per million of gallons filtered daily. On the supposition that the same work could be done here for \$500, added to which \$2,000 for interest on capital expended, makes a total of \$2,500 00 per annum for each million of gallons daily, or 365 million gallons at \$6 85, or 1,000 gallons at  $\frac{7}{10}$  of a cent. nearly.

In conclusion of this Annual Report, in the Appendix, under the head of Management and Expenditure, will be found statements of all the cost for the maintenance of the different parts of the works during the year, and also of the expenditure on new works.

The whole respectfully submitted.

I remain, gentlemen,

Your obedient servant,

LOUIS LESAGE,

*Supt of Water Works.*

MONTREAL, 22nd March, 1876.

## MONTREAL WATER WORKS,

*Engineer's Office,*

MONTREAL, February 11th, 1876.

LOUIS LESAGE, ESQ.,

*Superintendent and Chief Engineer,**Water Works, Montreal.*

DEAR SIR,

Conformably to your orders, I beg to submit the following statement in reference to the progress and present condition of the works for the New Aqueduct.

Excavation was continued all the winter of '74 to '75 between Station 38 and "Junction," about 87 men and 25 horses, on an average, being employed up to the end of March, when, the cuts being flooded (partly by springs and partly by surface water), work at that part had to stop for a time. It was not resumed there until September, and stopped finally in December.

On the 1st April, Steam Shovel No. 1, which had been laid up early in February, resumed her work, and continued it with occasional interruptions up to the end of October, when the cut was flooded from Station 19 to the "Junction" by the water from the main "Cours d'eau" (after a day and nights' heavy rain), breaking into it through sand and black muck, which was the only barrier to its ingress at that point. Subsequently a dam was made from the bank of the Old Aqueduct, across the "Cours d'eau" to the high ground on the north, the pond thus formed above the dam being furnished with a trough to carry the water across the Aqueduct to the ditch on south side. The trough is not large enough to carry the water in freshet seasons, and the south bank of the Aqueduct is endangered by the scouring action of the surplus water finding its way out at the sides of and under the trough. Steps should be taken in time to prevent damage from this cause.

When working near Station 37 + 50, Shovel No. 1 struck a seam of "hard pan" about 300 feet wide, and in depth reaching as

far as the but had yet gone, and crossing the cut diagonally in a direction about N.E. and S.W. Through this her progress was very slow, sometimes not advancing 20 feet in a day, and frequently breaking her lifting chain.

The cut in which Shovel No. 2 had been left during the winter, having filled with water, which was not removed until well on in June, it was the 21st of that month before she was ready for work. She worked from that time, with many delays (principally from water), until the middle of October, when she was laid up. She did a considerable part of the excavation for the foundation of the entrance bridge, and in getting down to the required depth encountered water in large quantities.

Excavation for the culvert at Section 43 was commenced in the latter part of September, but has not been completed.

The roadway on right bank from Section 3 to 20 + 50 has been excavated, and the mucking has been done in several places where embankments are to be formed, but there still remains a considerable portion to do.

A short piece of embankment on the right, about 30 feet in length, has been begun, but remains unfinished.

Of ditching at the back of spoil banks, there have been done 5,957 lineal feet, leaving about 700 feet still to do, not taking into account that part on the west of New Cut from Lower Lachine Road to a point nearly opposite the apex of the two tangents, and which may require a brick culvert or wooden box, the cutting being so deep that the slopes of an open ditch would occupy nearly the whole width of the lane between the Fraser Estate and the Corporation grounds.

The total earth excavation done up to the present amounts to about 61 per cent. of the whole quantity as given in your original estimate.

Many causes have retarded the progress of the work during the past season; amongst them, frequent rains, rendering the tracks unfit to sustain a locomotive and train of loaded cars; strikes among the labourers—with many of them drinking bouts recurring as regularly as pay-day, and lasting usually a week; but the principal source of

delay and trouble has been the flooding of the cuts by springs and sometimes by surface water. The pumping machinery used in former seasons' operations, and which was effective until the excavation reached within some five feet of bottom grade, proved inadequate when deeper cuttings were made; and so, engines being worked beyond their legitimate capacity, and gradually wearing out, the necessity for repairs became more and more frequent, each stoppage of the pumping necessitating a like stoppage of the work in the cut, whether by steam shovel, or by hand.

The pumps used by Mr. Donnelly are the submerged centrifugal pump and the rotary pump with fan at top. The former is the favourite.

In connection with the question of getting rid of water, I would beg to remind you of the necessity of taking steps as early as possible for cleaning out and deepening the off-take ditch on south side of Old Aqueduct, from the culvert at "Junction," far enough to secure a fall, as this ditch is all that is to be relied on for carrying whatever water may be pumped from the east end of the New Cut.

No large quantity of boulders has been found in the excavation. The greater part of such as have been got has been used for building the dry wall, lining the slopes of the Aqueduct. About 2,250 lineal feet or nearly 25 per cent. of these slope walls has been built.

No other masonry has been built. The stone for the structures has been delivered on the ground, and workmen have been dressing them until some time in December last. A portion of the stone for the culvert wells has been hauled to the spot.

One crib for the entrance pier was got into position and sunk during the winter of '74 to '75. Some of its top timbers were torn away on the 18th April, by the lake ice coming down the river.

Two cribs, one of 45 and the other of 70 feet in length, have been built and sunk in position, on the outer line of still-water basin; the former at the outer end of the cross pier, and the latter about 230 feet up stream, measured from upper side of cross pier. This 70 feet crib was built for, and placed in said position, to afford a station from which to moor other cribs whilst being sunk; at the same time, should

the Corporation determine to carry out the plan of the basin as originally designed, this crib, from its position, will be available as part of the work.

Two other cribs, one of 45 and the other of 50 feet, have been built for, and when sunk, will complete the upper line of the cross pier. A small portion of the superstructure of this pier has been built, and some land ties put in. The embankment between the upper and lower lines of crib work forming this pier, has been raised too high, and will have to be cut down to the level of the finished crib work.

Crib work at this point was commenced very late in the season, owing to the question being raised as to the advisability of putting in a superior class of work to that provided for in the contract. The discussion of this question, and that of a price for the proposed alteration, was prolonged until the season was far advanced. In the interim, the work for protecting the river bank on the north side of the basin was commenced, and a length of 400 feet built, on an average to within about 2 feet of the top, which is the level of 44.00 above datum.

None of the permanent fencing has been done. Dredging of the still water basin has not been commenced.

The temporary bridge, for the Lower Lachine Road, across the cut at Station 1, has been removed to allow the steam shovel to work there. Another bridge was erected just at the "entrance," and a dam has been formed across the "entrance," just outside the new bridge.

At Station 29, a temporary bridge to accommodate the farmers in the vicinity has lately been put across the cut by the Corporation.

Mr. Donnelly stopped work on his contract about the middle of December last. Tenders for the completion of the work were advertised for and received, but no award has been made up to the present. In the meantime, a winter unusually favourable for the prosecution of the work has almost gone by.

The machinery for the regulating gates was delivered on the ground by Mr. Chanteloup, the contractor, last winter and spring, and the girders, I understand, are now ready.

The girders for the "entrance bridge" are on the ground.



Last winter, soundings were taken over the still-water basin, at distances of 10 feet on that part of basin where ice had formed, and outside of that, at distances of 50 feet up stream and 10 feet across, as far out as south side of basin.

I regret to tell you that a fatal accident (the only one on these works since their commencement) occurred at Caughnawaga last August, in moving the quarried stone. A derrick boom fell and crushed an unfortunate man. The Coroner's inquiry, which followed, resulted in showing that the accident was due to the victim's carelessness alone.

I have further to mention, that the Engineer's office at the "new entrance" was destroyed by fire on Sunday, January 30th, 1876, at about 3 o'clock a.m. The cause of the fire is unknown, and the hour at which it occurred precludes the surmise that it might in any way have originated from the stove in the office. All field and office instruments, with furniture, &c., were destroyed. Fortunately, the field and estimate books, with all plans of value (which, if lost, could not have been replaced), had been removed to the City Hall shortly before. The rest is covered by insurance.

Trusting that the foregoing statement touches all points of importance in reference to the progress and present condition of the work under my charge,

I remain,

Dear sir,

Your obdt servant,

B. D. McCONNELL,

*Resident Engineer, New Aqueduct.*

## APPENDIX.

No. 1.—SCHEDULE shewing the duty of the Turbine Wheels.

MONTH.	Revolutions Wheel No. 1.	Revolutions Wheel No. 2.	Total No. of Revolutions.	Number of gallons Pumped.	Olive Oil in gallons.	Coal Oil in gallons.	Tallow in pounds.	Coal for Fuel in pounds.
1875								
January .....		337,871	337,871	50,004,908	.....	13,11	.....	10,495
February .....		40,082	40,082	5,932,136	.....	7,48	.....	7,540
March .....						5,61	.....	3,480
April .....	54,717	179,184	233,903	34,268,559	4,72	5,92	.....	2,575
May .....	534,870	487,835	1,022,705	196,824,290	27,50	14,34	.....	3,080
June .....	554,496	486,039	1,040,535	261,131,340	36,11	11,54	77,00	.....
July .....	486,586	356,815	843,401	166,183,158	33,05	11,22	.....	.....
August .....	510,259	100,217	610,476	133,722,463	25,83	10,91	4,00	.....
September .....	492,990	226,860	719,850	148,441,950	22,50	12,47	.....	.....
October .....	560,047	520,260	1,080,307	207,489,431	11,66	30,89	.....	4,550
November .....	501,404	397,053	898,457	175,590,976	24,44	18,96	.....	7,880
December .....	456,604	136,104	592,708	126,532,124	8,61	23,35	.....	10,580
Total .....	4,151,973	3,268,322	7,420,295	1,451,121,365	194,42	165,80	81,00	50,130
Last year .....	3,783,430	2,690,558	6,473,988	1,206,071,262	227,87	118,24	568,01	34,505

No. 2.—SCHEDULE shewing the duty of Breast Wheel.

MONTH.	Revolutions.	Number of Gallons Pumped.	Olive Oil in gallons.	Coal Oil in gallons.	Tallow in pounds.	Coal for Fuel in pounds.
1875						
January .....	385,011	56,981,628	13,61	23,39	.....	18,910
February .....	41,102	6,083,096	5,55	12,47	.....	16,530
March .....			1,67	6,55	.....	14,685
April .....	147,450	21,822,600	9,16	13,72	.....	6,160
May .....	522,499	77,329,852	18,61	17,77	.....	.....
June .....	499,000	73,852,000	30,00	14,97	.....	.....
July .....	511,707	75,732,636	23,33	15,59	.....	.....
August .....	456,388	67,545,424	14,44	17,15	.....	.....
September .....	219,430	32,475,640	13,88	17,46	.....	.....
October .....	32,132	4,755,536	14,12	22,45	12,00	.....
November .....	67,496	9,989,408	11,11	20,27	.....	3,960
December .....	12,619	1,867,612	4,96	14,01	.....	16,120
Total .....	2,894,834	428,435,432	160,44	195,80	12,00	76,365
Last year .....	5,158,010	763,385,480	146,33	134,90	63,00	26,950

No. 3.—SCHEDULES shewing the duty of Engines Nos. 1, 2 and 3.

MONTH.	Engine No. 1.		Engine No. 2.		Engine No. 3.		Total number of Gallons pumped during the month.	Number of Gallons pumped during the month.	Total number of Gallons pumped during the month.	Coals consumed for pumping, in pounds.	Coals consumed for Banking fires in pounds.	Olive Oil in Gallons.	Coal Oil in Gallons.	Num. of pounds of coals to raise 1 million gals.	Average pressure of Pump Pistons.	
	Running Time.	Revolutions.	Running Time.	Revolutions.	Running Time.	Revolutions.									No. 1	No. 2
1875.	H. M.		H. M.		H. M.											
January ..	108.35	85,289	15,170,355	459.35	452,229	80,437,972	247.15	131,480	37,331,280	152,933,607	1,198,500	18,500	7,777	30,78	7,954	82
February ..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
March ..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
April ..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
May ..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
June ..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
July ..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
August ..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
September ..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
October ..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
November ..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
December ..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total ..	144.20	112,234	19,963,062	1,022.25	1,023,677	182,081,426	3,861.45	.....	1,124,123,944	1,326,468,422	7,846,556	379,190	166.06	512.39	6,204	.....

No. 4.—SCHEDULE showing the duty of High Level Service Engine.

MONTH.	Engine.		Number of gallons pumped during the month.	Coals consumed for pumping in pounds	Coals consumed for blanking fires in pounds.	Olive Oil in gallons.	Coal Oil in gallons.	No. of pounds of coals to raise 1 million gallons.	Average pressure of water in the pump pistons.
	Running Time.	Revolutions.							
1875									
January .....									
February .....									
March .....									
April .....									
May .....									
June .....									
July .....									
August .....									
September .....									
October .....									
November .....									
December .....									
Total .....	125.38	473.243	5,678.916	23,001	11,838	2 28	12.00	12,563	

No. 5.—SCHEDULE showing the Level of Water and Evaporation at the McTavish Street Reservoir, for the year 1875.

MONTH.	Average Monthly Depth.	Rain Gauges in Inches.				Evaporation in Inches.
		Rain.	Snow.	Reduced to Rain.	Total Rain.	
1875.						
January.....	16.20	.....	20.50	1.56	1.56	1.19
February.....	20.92	0.13	16.50	1.48	1.61	1.25
March.....	21.36	0.82	11.25	1.09	1.91	1.42
April.....	19.88	0.77	7.25	0.58	1.35	2.16
May.....	22.68	3.79	3.00	0.36	4.15	2.93
June.....	22.06	3.08	.....	.....	3.08	3.58
July.....	21.96	3.11	.....	.....	3.11	4.34
August.....	17.23	1.63	.....	.....	1.63	5.13
September.....	16.33	2.35	.....	.....	2.35	3.37
October.....	21.37	3.69	1.00	0.50	4.19	2.18
November.....	19.52	.....	11.50	1.19	1.19	1.33
Decemberr.....	21.68	0 10	14.50	1.22	1.32	1.22
Total.....	.....	19.47	85.50	7.98	27.45	30.10
Last year.....	.....	20.24	60.82	4.88	25.12	28.50

No. 6.—Number of places where the Corporation Plumbers were called during the Winter 1874-75, indicating the number of cases where the Corporation and the water tenants were at fault.

CORPORATION SIDE.		LANDLORD & TENANTS' SIDES.	
Choked.....	10	Service Pipes at fault:	
Frozen outside.....	520	Frozen inside.....	128
Other causes.....	8	“ in wall.....	714
		Burst by frost.....	5
		Other causes.....	11
	538		
			858
			538
			1396
		Grand Total.....	1396

There has been 295 Fire Hydrants found frozen 314 times during the winter 1874-1875.

No. 7.— COMPARATIVE SCHEDULE showing the Daily Consumption for each Month, from 1866 to 1875, in the City of Montreal.

Daily Average.	1866.	1867.	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.
January.....	4,060,503	4,809,262	3,665,329	4,322,122	5,490,715	5,678,174	5,374,840	7,290,852	7,095,986	8,384,520
February.....	2,219,809	5,239,869	2,725,756	2,479,917	4,982,132	6,108,120	5,449,747	7,063,017	7,869,775	8,722,379
March.....	2,562,627	4,837,717	3,717,735	1,671,831	3,428,207	6,485,962	4,900,149	7,012,675	7,744,778	8,648,153
April.....	4,538,395	5,850,820	5,293,004	4,583,000	5,475,387	6,356,588	8,064,601	7,279,311	8,410,697	8,677,975
May.....	4,538,332	5,284,999	4,787,956	4,498,636	5,881,214	6,559,613	7,282,758	6,833,600	7,523,392	8,843,682
June.....	4,708,153	6,036,586	4,966,311	5,147,939	6,397,578	6,569,112	7,392,330	7,865,951	7,449,288	9,342,653
July.....	5,690,600	6,456,322	5,978,677	5,074,155	6,717,105	6,814,104	7,643,349	7,786,051	9,039,422	9,361,989
August.....	5,639,903	6,075,179	5,765,896	5,543,778	6,684,834	7,142,800	6,543,069	8,563,739	9,452,456	8,391,686
September....	5,478,200	5,499,087	5,916,460	5,919,435	6,518,369	6,780,880	7,224,962	7,055,885	8,995,643	9,065,770
October.....	5,460,095	6,580,319	5,586,033	5,605,714	5,837,973	6,547,957	6,615,049	9,168,172	8,561,262	8,614,050
November.....	5,625,380	5,112,411	4,262,538	5,131,895	6,117,934	6,046,708	6,288,247	6,862,111	7,974,388	8,821,966
December.....	5,624,358	4,718,387	4,511,300	5,156,472	6,012,224	6,104,278	6,622,527	7,017,387	8,395,810	8,547,777
Total.....	56,146,355	65,337,025	57,177,085	55,134,894	68,643,672	77,194,296	79,981,628	88,798,751	98,512,897	105,422,600
Daily average for the year.	4,678,863	5,444,752	4,801,489	4,594,574	5,730,306	6,432,858	6,665,136	7,399,806	8,209,408	8,785,217
Increase.....	409,809	765,889	.....	.....	1,125,732	712,552	232,278	734,620	809,602	575,809
Decrease.....	.....	.....	625,263	224,915	.....	.....	.....	.....	.....	.....

No. 8.— SCHEDULE showing the Repairs done to Main Pipes, Hydrants and Valves, during the year 1875.

POSITION.	DATE. 1875.	DIAMETER.	VALVES.	HYDRANTS.	BREAKS.	LEAKS.	HOW REPAIRED.	PROBABLE CAUSE OF INJURY.
Montcalm and Craig.....	Jan. 1	1	1	1	1	1	Put on a new valve.	Valve worn out.
Victoria, above St. Catherine.....	" 4	4	1	1	1	1	"	"
Bonaventure, near Richmond.....	" 5	10 in.	1	1	1	1	Recaulked the Joint.	Joint blown out.
William, near Seigneurs.....	" 6	10 in.	1	1	1	1	"	"
Alexander, opposite Gesù Church...	" 7	10 in.	1	1	1	1	Put on a new valve.	Valve worn out.
Dalhousie, near Ottawa.....	" 14	6 in.	1	1	1	1	Put in a new piece.	Broken Pipe,—cause unknown.
William and Dalhousie.....	" 16	6 in.	1	1	1	1	Put in a new spindle.	Screw of spindle worn out
Bleury and Lagauchetière.....	" 18	6 in.	1	1	1	1	Put on a new valve.	Valve worn out.
Chatham, above Rail Track.....	" 19	6 in.	1	1	1	1	"	"
Ottawa and Duke.....	" 22	6 in.	1	1	1	1	Put in a new piece.	Pipe leading to hydrant split, cause unknown.
Sherbrooke and St. Lawrence.....	" 28	6 in.	1	1	1	1	Put on a new valve.	Rod broken valve worn out.
Wellington and Dalhousie.....	" 29	6 in.	1	1	1	1	Put in a new spindle.	Screw of spindle worn out.
William St., at Cantin's.....	Feb. 6	6 in.	1	1	1	1	Put on a new valve.	Valve worn out.
Nazareth and Common.....	" 12	4 in.	1	1	1	1	Put in a new spindle.	Screw of spindle worn out
William and Duke.....	" 13	4 in.	1	1	1	1	Put on a new valve.	Valve worn out
St. Urbain and Bagg.....	" 15	4 in.	1	1	1	1	"	"
St. Charles Borromée, ab. Dorchester	" 16	4 in.	1	1	1	1	"	"
Fortification, near Victoria Square..	" 20	6 in.	1	1	1	1	Put in a new piece.	Pipe leading to hydrant broken, cause unknown.
Lagauchetière and Bleury.....	" 22	6 in.	1	1	1	1	Put on a new valve.	Valve worn out.
Sherbrooke, St. Antoine Ward.....	" 25	6 in.	1	1	1	1	"	"
St. Joseph and Mountain.....	" 27	6 in.	1	1	1	1	Put in a new spindle.	Screw of spindle worn out.
St. André, near St. Catherine.....	Mar. 2	4 in.	1	1	1	1	Put in a new piece.	Broken pipe,—cause unknown.
St. Christophe.....	" 3	4 in.	1	1	1	1	Put on a new valve.	Valve worn out.
St. Urbain and St. Catherine.....	" 5	6 in.	1	1	1	1	Put in a new spindle.	Screw of spindle worn out.

Aylmer.....	Mar.	8	4 in.	1	Put in a new spindle.	Screw of spindle worn out.
Wellington and Dalhousie.....	"	10	.....	1	Put on a new valve.	Valve worn out.
St. Charles Borromée, ab. Dorchester	"	15	.....	1	Changed the hydrant.	Broken pipe.
St. Urbain and Evans.....	"	17	.....	1	"	"
William and Duke.....	"	17	.....	1	"	Seat of hydrant broken by frost.
Wellington and Magdalen.....	"	18	.....	1	"	Hydrant rod broken.
Jacques-Cartier, near St. Catherine..	"	19	4 in.	1	Put in a new piece.	Broken pipe,—cause unknown.
St. Étienne and Forfar.....	"	22	.....	1	"	Hydrant split by frost.
Amherst and St. Catherine.....	"	23	6 in.	1	"	Pipe split,—cause unknown.
Bonaparte, Leak on Main.....	"	24	4 in.	1	Recalculated the joint.	Joint blown out.
Wellington and Grand Trunk.....	"	27	.....	1	Repaired the rod.	Rod broken, cause unknown.
St. Frs.-Xavier and Hospital.....	"	30	.....	1	"	"
McKay, near Sherbrooke.....	April	5	.....	1	Changed the hydrant.	"
Ottawa, near Guy.....	"	7	6 in.	1	Put in a new piece.	Pipe split,—cause unknown.
Sydenham and Lafontaine.....	"	8	4 in.	1	"	Broken pipe " "
Manufacturers, near City Limits.....	"	9	4 in.	1	"	"
Bonaventure.....	"	12	4 in.	1	Put in a new hydrant.	Broken by a run away horse.
Lagauchetière and Papineau.....	"	15	.....	1	"	Broken by frost.
Jacques-Cartier, near Ontario.....	"	20	4 in.	1	"	Broken pipe, cause unknown.
St. Mary, Molson's Brewery.....	"	22	.....	1	"	Old American hydrant broken.
Aqueduc and St. Antoine.....	"	24	4 in.	1	"	Screw of spindle worn out.
Guilbault, near St. Urbain.....	"	27	4 in.	1	"	Broken pipe on a boulder.
German and Lagauchetière.....	"	28	.....	1	Put on a new valve.	Valve worn out.
St. Catherine, St. Louis Ward.....	"	30	.....	1	"	"
Latour and St. Geneviève.....	May	1	4 in.	1	Recalculated the joint.	Joint blown out.
St. Denis and Ontario.....	"	3	.....	1	Put on a new valve.	Valve worn out.
St. Mary and Colborne Avenue.....	"	5	10 in.	1	Put in a new spindle.	Screw of spindle worn out.
Visitation, near Robin.....	"	7	6 in.	1	Recalculated the joint.	Joint blown out.
Drummond, near Sherbrooke.....	"	10	.....	1	Put in a new hydrant.	Seat of old one broken by frost.
Radegonde, near Craig.....	"	12	3 in.	1	"	Pipe split, cause unknown.



SCHEDULE showing the Repairs done to Main Pipes, Hydrants and Valves, during the Year 1875.

POSITION.	DATE. 1875.	DIAMETER.	VALVES.	HYDRANTS.	BREAKS.	LEAKS.	HOW REPAIRED.	PROBABLE CAUSE OF INJURY.
Murray, near Ottawa .....	May 14	4 in.	1	1	1	1	Recalked the joint.	Joint blown out.
St. Lawrence and St. Catherine .....	" 17	6 in.	1	1	1	1	Put in a new spindle.	Screw of spindle worn out.
St. Paul and Frigonne .....	" 20	1	1	1	1	1	Changed the hydrant.	Seat of old one split by frost.
Metcalfe and Burnside .....	" 24	1	1	1	1	1	Put on a new valve.	Rod broken.
Conway, near St. Charles .....	" 26	6 in.	1	1	1	1	Recalked the joint.	Joint blown out.
Dalhousie, near Wellington .....	" 27	6 in.	1	1	1	1	Put in a new piece.	Pipe split, cause unknown.
Metcalfe and Burnside .....	" 28	1	1	1	1	1	Put on a new valve.	Valve worn out.
Wellington and S. S. Canal .....	June 1	12 in.	1	1	1	1	Put in a new piece.	Pipe split, cause unknown.
Queen, near Wellington .....	" 2	4 in.	1	1	1	1	Put on a new valve.	" "
Bonaventure and Richmond .....	" 4	1	1	1	1	1	" "	Valve worn out.
St. Dominique, near Ontario .....	" 5	4 in.	1	1	1	1	Put in a new piece.	Pipe burst, cause unknown.
Lagauchetière and St. Constant .....	" 7	1	1	1	1	1	Put on a new valve.	Valve worn out.
Notre Dame and Dalhousie .....	" 8	1	1	1	1	1	" "	" "
St. Paul and St. Frs.-Xavier .....	" 9	6 in.	1	1	1	1	Put in a new spindle.	Screw of spindle worn out.
Aqueduc, near St. Joseph .....	" 10	4 in.	1	1	1	1	Recalked the joint.	Joint blown out.
Mill Str., at Barclay's .....	" 11	1	1	1	1	1	Put on a new valve.	Valve worn out.
Sherbrooke and Guy .....	" 12	6 in.	1	1	1	1	Put in a new spindle.	Screw of spindle worn out.
Sanguinet and Vitre .....	" 14	1	1	1	1	1	Put on a new valve.	Valve worn out.
Craig and St. Lawrence .....	" 15	1	1	1	1	1	" "	" "
" and Redegonde .....	" 16	1	1	1	1	1	" "	" "
Wellington and Dalhousie .....	" 17	1	1	1	1	1	" "	" "
Colborne and Wellington .....	" 18	1	1	1	1	1	Put in a new hydrant.	Hydrant broken by a run-away horse.
Queen, near .....	" 19	4 in.	1	1	1	1	Put in a new piece.	Pipe split, cause unknown.

St. Dominique and Vitre	June 21	1	1	Put on a new hydrant.	Old one split by frost.
Dorchester and Papineau	" 23	1	1	Changed the " "	" "
" and Visitation	" 24	1	1	Put in a new " "	Hydrant broken,—cause unknown.
McGill, near College	" 25	6 in.	1	Recaulked the joint.	Joint blown out.
Wellington and Duke	" 26	1	1	Put on a new valve.	Valve worn out.
St. Catherine and St. Elizabeth	" 28	1	1	" "	" "
Dorchester, near Beaudry	" 29	1	1	" "	" "
Lagauchetiere and Chenneville	" 30	1	1	" "	" "
" and Beagonde Hill	July 1	6 in.	1	Put in a spindle.	Screw of spindle worn out.
University and Sherbrooke	" 2	4 in.	1	" "	" "
St. Dominique and "	" 3	4 in.	1	" "	" "
Visitation, near Ontario	" 5	6 in.	1	Recaulked the joint.	Joint blown out.
William and Dalhousie	" 6	6 in.	1	Put in a new spindle.	Screw of spindle worn out.
Dorchester, near Sanguinet	" 8	10 in.	1	" "	" "
St. Frs.-Xavier and St. Paul	" 10	1	1	Recaulked the joint.	Joint blown out.
Press on St. Catherine	" 12	4 in.	1	Put in a new jacket.	Gasket worn out.
St. Joseph and St. Henry	" 13	4 in.	1	Put on a new valve.	Screw of spindle worn out.
St. Mary and Monarque	" 14	6 in.	1	Put in a new spindle.	Valve worn out.
Dalhousie and Wellington	" 14	6 in.	1	" "	Screw of spindle worn out.
" and William	" 14	1	1	Put on a new valve.	Valve broken.
Mill Str., at Warehousing Co.	" 15	4 in.	1	Put in a new spindle.	Screw of spindle worn out.
St. Felix, near Bonaventure	" 16	4 in.	1	Recaulked the joint.	Joint blown out.
St. Hubert and St. Catherine	" 17	4 in.	1	Put in a new spindle.	Screw of Spindle worn out.
Victoria, above	" 19	1	1	Put in a new hydrant.	Seat of hydrant broken by frost.
Latour and Beagonde	" 20	4 in.	1	Put in a new spindle.	Screw of spindle worn out.
Mountain and Bonaventure	" 21	1	1	Put in a new hydrant.	Old one broken by a runaway horse.
Wellington and McCord	" 22	1	1	Put on a new valve.	Valve worn out.
St. James and St. Frs.-Xavier	" 23	1	1	" "	" "
William and McCord	" 24	1	1	" "	" "

**SCHEDULE showing the Repairs done to Main Pipes, Hydrants and Valves, during the year 1876.**

POSITION.	DATE. 1875.	DIAMETER.	VALVES.	HYDRANTS.	BREAKS.	LEAKS.	HOW REPAIRED.	PROBABLE CAUSE OF INJURY.
Dorchester and Visitation.....	July 26	.....	1	1	1	1	Put on a new valve.	Valve worn out.
Seigneurs and Bonaventure.....	" 27	.....	1	1	1	1	" "	" "
Seaton and Mignonne.....	" 28	.....	1	1	1	1	" "	" "
Richmond Str., opposite Church....	" 30	.....	1	1	1	1	" "	" "
Seaton and St. Catherine.....	Aug. 2	4 in.	1	1	1	1	Put in a new spindle.	Screw of spindle worn out.
Sanguinet, near Dorchester.....	" 3	4 in.	1	1	1	1	Put in a new piece.	Broken by drain.
Duham, above Mignonne.....	" 4	4 in.	1	1	1	1	Recalked the joint.	Joint blown out.
German and ".....	" 5	.....	1	1	1	1	Put on a new valve.	Valve worn out.
St. Mary and Parthenais.....	" 6	.....	1	1	1	1	" "	" "
St. Frs.-Xavier and Notre Dame....	" 7	.....	1	1	1	1	" "	" "
Fullum and St. Mary.....	" 9	6 in.	1	1	1	1	Put in a new spindle.	Screw of spindle worn out.
Aqueduct and St. Joseph.....	" 10	4 in.	1	1	1	1	" "	" "
Craig and Wolfe.....	" 11	.....	1	1	1	1	Put on a new valve.	Valve worn out.
Sherbrooke and City Councillors....	" 12	.....	1	1	1	1	Put in a new piece.	Moving hydrant.
St. Denis and Emery.....	" 13	.....	1	1	1	1	Put on a new valve.	Valve worn out.
Panet and St. Catherine.....	" 16	6 in.	1	1	1	1	Put in a new spindle.	Screw of spindle worn out.
Jurons and Bleury.....	" 17	4 in.	1	1	1	1	" "	" "
Eleonor and William.....	" 18	4 in.	1	1	1	1	" "	" "
St. Constant, near Ontario.....	" 19	4 in.	1	1	1	1	Recalked the joint.	Joint blown out.
Water and Montcalm.....	" 20	.....	1	1	1	1	Put on a new valve.	Valve worn out.
St. Mark and St. Luke.....	" 21	.....	1	1	1	1	Changed the hydrant.	Rod broken.
Lusignan, near St. Antoine.....	" 23	4 in.	1	1	1	1	Recalked the joint.	Joint blown out.
McGill, near Lemoine.....	" 23	6 in.	1	1	1	1	" "	" "

St. Catherine and Seaton .....	Aug.	24	4 in.	1	1	...	Put in a new spindle.	Screw of spindle worn out.
St. Catherine and Sydenham .....	"	24	4 in.	1	1	...	"	"
Dorchester and Mansfield .....	"	25	.....	1	1	...	Put in a new piece.	Moving hydrant.
Sherbrooke and Union Avenue .....	"	26	.....	1	1	...	"	Raising hydrant.
Ottawa, near Eleonor .....	"	27	6 in.	1	1	...	1 Recaulked the joint.	Joint blown out.
Craig and St. Urban .....	"	28	.....	1	1	...	Put on a new valve.	Valve worn out.
Visitation and St. Catherine .....	"	30	6 in.	1	1	...	Put in a new spindle.	Screw of spindle worn out.
Dorchester and Metcalfe .....	"	31	.....	1	1	...	" piece.	Moving hydrant.
McGill and College .....	Sept.	2	.....	1	1	...	Put on a new valve.	Valve worn out.
Visitation, near Lafontaine .....	"	3	6 in.	1	1	...	1 Recaulked the joint.	Joint blown out.
St. Denis and Ontario .....	"	4	.....	1	1	...	Put in a new piece.	Raising hydrant.
St. Catherine and St. Elizabeth .....	"	6	.....	1	1	...	Changing the hydrant.	Hydrant split by frost.
Menai .....	"	7	4 in.	1	1	...	1 Recaulked the joint.	Joint blown out.
Up University, last hydrant .....	"	9	.....	1	1	...	Put on a new valve.	Valve worn out.
McTavish .....	"	10	.....	1	1	...	"	"
McCord and Ottawa .....	"	10	.....	1	1	...	Put in a new piece.	To raise hydrant.
City Councillor, near St. Catherine ..	"	11	4 in.	1	1	...	"	Pipe split, cause unknown.
Bonaventure and Canning .....	"	12	.....	1	1	...	Put on a new valve.	Valve worn out.
Lafontaine and Visitation .....	"	15	.....	1	1	...	"	"
St. Joseph and Canning .....	"	16	.....	1	1	...	"	"
Dorchester and Drummond .....	"	19	.....	1	1	...	"	"
" and Aqueduct .....	"	21	.....	1	1	...	Put in a new piece.	Moving the hydrant.
Colborne, near William .....	"	23	6 in.	1	1	...	1 Recaulked the joint.	Joint blown out.
Dorchester, near St. Denis .....	"	27	10 in.	1	1	...	"	"
Fulford and St. Joseph .....	"	30	.....	1	1	...	Put on a new valve.	Valve worn out.
St. Catherine and Seaton .....	Oct.	2	4 in.	1	1	...	Put in a new spindle.	Screw of spindle worn out.
Wellington, near R. R. Track .....	"	4	12 in.	1	1	...	1 Recaulked the joint.	Joint blown out.
Balmoral .....	"	5	.....	1	1	...	Put on a new valve.	Valve worn out.
McGill and College .....	"	6	.....	1	1	...	"	"
Bagg and St. Urban .....	"	8	.....	1	1	...	"	"

SCHEDULE showing the Repairs done to Main Pipes, Hydrants and Valves, during the year 1875.

POSITION.	DATE. 1875.	DIAMETER.	VALVES.	HYDRANTS.	BREAKS.	LEAKS.	HOW REPAIRED.	PROBABLE CAUSE OF INJURY.
Mignonne and Seaton .....	Oct. 9	.....	.....	1	.....	.....	Put on a new valve.	Valve worn out.
Sanguinet, near St. Catherine.....	" 11	4 in.	.....	.....	1	.....	Put in a new piece.	Pipe broken by drain.
Chenilleville and Craig, Fire Station.	" 12	.....	.....	1	.....	.....	Changed the hydrant.	Old hydrant broken.
Sherbrooke, moving hydrant .....	" 14	.....	.....	1	.....	.....	Put in a new piece.	On account new paving chain stone
Dorchester, above Guy .....	" 18	.....	.....	1	.....	.....	" "	" "
William and Murray .....	" 19	.....	.....	1	.....	.....	Put on a new valve.	Valve worn out.
St. Hubert, near Lagauchetière .....	" 20	4 in.	.....	1	.....	.....	1 Recaulked the joint.	Joint blown out.
Mountain and St. Joseph .....	" 21	.....	.....	1	.....	.....	Put on a new valve.	Valve worn out.
Panet and St. Catherine .....	" 22	6 in.	1	.....	.....	.....	Put on a new valve.	Screw of spindle worn out.
Dufresne and St. Mary .....	" 23	.....	.....	1	.....	.....	Put on a new valve.	Valve worn out.
Peel, above Sherbrooke .....	" 26	4 in.	.....	.....	.....	.....	Put in a new piece.	Pipe split, cause unknown.
Common, near King .....	" 28	6 in.	.....	.....	.....	.....	1 Recaulked the joint.	Joint blown out.
St. Mary and Panet .....	" 29	4 in.	1	.....	.....	.....	Put in a new spindle.	Screw of spindle worn out.
St. Paul and St. Peter .....	" 30	4 in.	1	.....	.....	.....	" "	" "
Dorchester, above Guy .....	Nov 1	.....	.....	1	.....	.....	Put in a new piece.	On account of new footpath.
Visitation, above Ontario .....	" 4	6 in.	.....	.....	1	.....	" "	Broken Pipe, cause unknown.
Sherbrooke and St. Lawrence .....	" 5	6 in.	1	.....	.....	.....	Put in a new spindle.	Screw of spindle worn out.
St. Constant, above Ontario .....	" 11	4 in.	.....	.....	1	.....	" "	Pipe split, cause unknown.
Fullum, above St. Catherine .....	" 12	6 in.	1	.....	.....	.....	" "	Screw of spindle worn out.
St. Lawrence and Mignonne .....	" 15	.....	.....	1	.....	.....	Put on a new valve.	Valve worn out.
Colborne, above William .....	" 16	6 in.	.....	.....	1	.....	1 Recaulked the joint.	Joint blown out.
St. Mary and Dalhousie .....	" 18	.....	.....	1	.....	.....	Put on a new valve.	Valve worn out.
St. Gabriel and St. Thérèse .....	" 19	.....	.....	1	.....	.....	" "	" "

Blcury and St. Catherine.....	Nov.	20	6 in.	1	1	Put in a new spindle.	Screw of spindle worn out.
Jacques-Cartier Sqre. & Notre Dame.	"	22	3 in.	1	1	Put on a new valve.	Old cock worn out.
St. Henry and St. Joseph.....	"	23	4 in.	1	1	Put in a new spindle.	Screw of spindle worn out.
St. Genevieve and Lagauchetière...	"	25	4 in.	1	1	"	"
Mansfield and St. Catherine.....	"	26	4 in.	1	1	"	"
St. Frs.-Xavier and Notre Dame....	"	27	6 in.	1	1	Put on a new valve.	Valve worn out.
Amherst and St. Catherine.....	"	29	6 in.	1	1	Put in a new piece.	Pipe broken, cause unknown.
Visitation, near Logan.....	"	30	6 in.	1	1	"	"
" and St. Catherine.....	Dec.	2	6 in.	1	1	"	"
Lagauchetière and Alexander.....	"	4	6 in.	1	1	"	"
Alexander, opposite Gesù Church...	"	6	6 in.	1	1	"	"
St. Charles Borromée, near Vitre....	"	9	4 in.	1	1	Put on a new valve.	Screw of spindle worn out.
St. Christophe.....	"	10	4 in.	1	1	"	Old one split.
Blcury, opposite Gesù Church.....	"	13	4 in.	1	1	Put on a new valve.	Valve worn out.
Craig and Gain.....	"	14	4 in.	1	1	Put on a new valve.	Valve worn out.
Visitation, above Mignonne.....	"	16	6 in.	1	1	"	"
Bonaventure, near Richmond.....	"	17	10 in.	1	1	Recaulked the joint.	Seat of old one broken.
Seaton and Mignonne.....	"	18	4 in.	1	1	Put in a new piece.	Joint blown out.
Sanguinet and Vitre.....	"	22	4 in.	1	1	Packing the valve.	Pipe split, cause unknown.
William, near Seigneurs.....	"	23	10 in.	1	1	Put on a new valve.	Valve worn out.
Logan and Seaton.....	"	24	10 in.	1	1	Recaulked the joint.	Joint blown out.
Common.....	"	27	6 in.	1	1	Put on a new valve.	Valve worn out.
St. Hubert and Lagauchetière.....	"	28	4 in.	1	1	Recaulked the joint.	Joint blown out.
Congregation.....	"	29	4 in.	1	1	Put in a new spindle.	Screw of spindle worn out.
Last hydrant on Shaw.....	"	31	4 in.	1	1	Put on a new valve.	Valve worn out.
St. Mary Str. St. Mary's Ward.....	"	31	4 in.	4	4	"	"
Peel, above Sherbrooke.....	"	31	4 in.	1	1	Put in a new one.	Old fashion hydrant.
Total.....			46	110	1338		

No. 9.—SCHEDULE shewing the different kind & sizes of Water Meters belonging to the Water Works and to private parties.

KIND.	SIZE IN INCHES.	PROPERTY OF THE WATER WORKS			Property of Private Parties.	
		IN THE CITY.	OUTSIDE OF THE CITY.	AT THE WORK SHOP.	IN THE CITY.	OUTSIDE OF THE CITY.
Gem.....	1	1	60	12	5	.....
".....	$\frac{1}{4}$	22	.....	11	4	.....
".....	1	6	.....	7	4	.....
".....	$1\frac{1}{2}$	6	.....	3	4	.....
".....	2	1	.....	.....	3	.....
".....	3	.....	.....	.....	3	.....
".....	4	7	1	3	.....	2
".....	6	2	.....	1	.....	.....
Worthington.....	$\frac{5}{8}$	2	.....	2	20	1
".....	1	2	.....	.....	.....	.....
".....	$1\frac{1}{2}$	.....	.....	.....	1	.....
".....	2	3	.....	.....	4	.....
".....	3	.....	.....	.....	.....	1
Union.....	$\frac{5}{8}$	28	64	.....	6	.....
".....	1	20	6	2	1	.....
".....	$\frac{3}{4}$	.....	.....	.....	1	.....
".....	2	.....	.....	.....	1	.....
".....	3	1	.....	.....	.....	.....
Providence.....	$\frac{3}{4}$	.....	.....	2	.....	.....
Maxim.....	$\frac{1}{2}$	.....	.....	1	.....	.....
Aubin.....	$\frac{1}{2}$	.....	.....	1	.....	.....
Desper.....	$\frac{1}{2}$	.....	1	.....	.....	.....
Fairechild.....	$\frac{1}{2}$	.....	.....	1	.....	.....

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that proper record-keeping is essential for transparency and accountability, particularly in financial matters. The text notes that without reliable records, it is difficult to track progress, identify issues, and make informed decisions.

2. The second part of the document outlines the various methods and tools used to collect and analyze data. It mentions the use of surveys, interviews, and focus groups to gather qualitative information, as well as statistical software and data visualization techniques for quantitative analysis. The importance of ensuring the reliability and validity of the data is stressed throughout this section.

3. The third part of the document describes the process of interpreting the results of the research. It highlights the need to consider the context of the data and to be cautious about drawing conclusions based solely on the numbers. The text suggests that researchers should look for patterns and trends, but also be aware of potential biases and limitations in the data.

4. The fourth part of the document discusses the importance of communicating the findings of the research to the relevant stakeholders. It emphasizes that clear and concise communication is key to ensuring that the information is understood and acted upon. The text suggests using a variety of communication channels, including reports, presentations, and workshops, to reach different audiences.

5. The fifth part of the document provides a summary of the key findings and conclusions of the research. It reiterates the importance of accurate record-keeping and the use of appropriate data collection and analysis methods. The text concludes by stating that the research has provided valuable insights into the topic and that further research is needed to address some of the remaining questions.



No. 10.—SCHEDULE showing the Pipes, Hydrants, Valves, Services, &c., laid in the City of Montreal, during the Year 1875.

NAMES OF STREETS.	LENGTH IN FEET OF CAST-IRON PIPES.							NUMBER OF VALVES.					Hydrants.	Brick Chambers.	Houses Supplied.	Length of Lead Pipes in feet.	Brass Stop Cocks.
	Lead.	12"	10"	6"	4"	3"	1½"	Total.	12"	10"	6"	4"					
<i>East Ward.</i>																	
St. Louis.....				930				930			1		1	1			
Gosford.....															1	38	1
Dalhousie Square.....															1	25	1
Total.....				930				930			1		1	1	2	63	2
<i>Centre Ward.</i>																	
Notre Dame.....																36	2
Normand.....				525	12			537						1	5	162	5
St. Francois Xavier.....			720					720	2				2	3	2	48	2
Total.....			720	525	12			1257	2				2	4	9	246	9
<i>West Ward.</i>																	
Fortification.....						120		120							2	26	2
Youville.....				200				200			1		1	1			
Common.....															2	106	2
St. Peter.....															2	50	2
Notre Dame.....														1	1		
Total.....				200		120		320			1		1	2	6	182	6



**SCHEDULE showing the Pipes, &c., laid down.—Continued.**

NAMES OF STREETS.	LENGTH IN FEET OF CAST-IRON PIPES.							NUMBER OF VALVES.					Hydrants.	Brick Chambers.	Houses Supplied.	Length of Lead Pipes in feet.	Brass Stop Cocks.	
	Lead.	12"	10"	6"	4"	3"	1½	Total.	12"	10"	6"	4"						Total.
<i>St. Ann's Ward. — Cont.</i>	120	.....	2300	.....	687	.....	.....	3107	.....	1	.....	2	3	.....	3	199	4119	184
Brought forward.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
King .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Chaboillez Square .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Menai .....	.....	.....	.....	.....	145	.....	.....	145	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Dupré Lane .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Seminary .....	.....	.....	.....	.....	180	.....	.....	180	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Seigneurs .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Guy.....	.....	.....	.....	.....	9	.....	.....	9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Ollier .....	.....	.....	.....	.....	54	.....	.....	54	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Richmond .....	.....	.....	.....	.....	60	.....	.....	60	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total .....	120	.....	2300	.....	1135	.....	.....	3555	.....	1	.....	2	3	.....	5	212	4448	197
<i>St. Antoine Ward.</i>	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Villa Avenue.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
McTavish .....	.....	.....	.....	.....	268	.....	.....	268	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mansfield .....	.....	.....	.....	.....	15	.....	.....	15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Metcalfe .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mackay .....	.....	.....	.....	270	.....	.....	.....	270	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Overdale Avenue.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Quesnel .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Albert.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Dominion .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Canning .....	.....	.....	.....	.....	18	.....	.....	18	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Chatham .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
St. Martin.....	.....	.....	.....	.....	288	.....	.....	288	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....



**SCHEDULE showing the Pipes, &c., laid down.—Continued.**

NAMES OF STREETS.	LENGTH IN FEET OF CAST-IRON PIPES.							NUMBER OF VALVES.					Hydrants	Brick Chambers	Houses Supplied.	Length of Lead Pipes in Feet.	Brass Stop Cocks.		
	LENGTH IN FEET OF CAST-IRON PIPES.							NUMBER OF VALVES.											
	Lead	12"	10"	6"	4"	3"	1½	Total.	12"	10"	6"	4"						Total.	
<i>St. Antoine Ward.—Cont.</i>																			
Brought forward.....	138	.....	1968	2928	1034	.....	.....	6290	1	1	6	4	.....	12	6	301	8278	301	
Sherbrooke.....	.....	.....	.....	.....	4	.....	.....	4	.....	.....	.....	1	.....	1	.....	2	59	2	
City Councillors.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	24	1	
St. Catherine.....	.....	9	150	2	.....	.....	.....	161	.....	.....	.....	.....	.....	.....	2	25	247	15	
Philippe Square.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	18	85	6	
Lusignan.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6	144	6	
Latour.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	1	.....	.....	.....	.....	
Simpson.....	.....	.....	.....	.....	649	.....	.....	649	.....	.....	.....	2	.....	2	3	4	2	61	2
Redpath.....	.....	.....	.....	.....	662	.....	.....	662	.....	.....	.....	1	.....	1	3	4	2	114	2
McGregor.....	.....	.....	.....	.....	990	.....	.....	990	.....	.....	.....	.....	.....	.....	.....	5	134	5	
Drummond.....	.....	.....	.....	.....	1260	.....	.....	1260	.....	.....	.....	1	.....	1	3	4	11	599	11
Foster Lane.....	31	.....	.....	.....	.....	.....	.....	31	.....	.....	.....	.....	.....	.....	1	1	2	72	2
Côte-des-Neiges Hill.....	.....	1055	.....	1470	.....	.....	.....	2525	1	2	.....	.....	3	3	6	.....	.....	.....	.....
Prince Arthur.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	31	1	.....
Craig.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	1	.....	1	2	40	2	.....
Aqueduct.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	8	93	8	.....
Richmond.....	.....	.....	.....	.....	60	.....	.....	60	.....	.....	.....	.....	.....	.....	.....	1	37	1	.....
Baile.....	.....	.....	.....	.....	518	.....	.....	518	.....	.....	.....	.....	.....	.....	1	7	231	7	.....
Victoria.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	38	1	.....
Bisson.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	98	4	.....
Belmont.....	.....	.....	.....	.....	108	.....	.....	108	.....	.....	.....	.....	.....	.....	.....	5	60	5	.....
Aylmer.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	15	1	.....
Cathedral.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	33	1	.....
Summerville Avenue.....	.....	.....	.....	.....	500	.....	.....	500	.....	.....	.....	1	.....	1	.....	1	31	1	.....
Stanley.....	.....	.....	.....	.....	518	.....	.....	518	.....	.....	.....	1	.....	1	.....	1	34	1	.....



SCHEDULE showing the Pipes, &c., laid down.— *Continued.*

NAMES OF STREETS.	LENGTH IN FEET OF CAST-IRON PIPES.					NUMBER OF VALVES.					Hydrants.	Brick Chambers.	Houses Supplied.	Length of Lead Pipes in Feet	Brass Stop Cocks.
	Lead.	12"	10"	6"	4"	3"	1½"	Total.	12"	10"	6"	4"	Total.		
<i>St. Louis Ward.</i>															
St. Dominique.....	...	...	...	...	...	...	...	...	...	...	...	...	16	316	15
St. Constant.....	...	...	...	...	...	...	...	...	...	...	...	...	4	76	4
Pantaléon.....	...	...	...	...	...	...	...	...	...	...	...	...	10	111	9
St. Lawrence.....	...	83	...	...	...	...	...	83	2	...	...	...	19	342	19
St. Hypolite.....	...	...	...	...	...	...	...	...	...	...	...	...	9	234	9
St. Denis.....	...	...	...	...	...	...	...	...	...	...	...	...	27	450	27
Sanguinet.....	...	...	...	...	...	...	...	...	...	...	...	...	14	244	14
Ste. Justine.....	...	...	...	...	...	...	...	...	...	...	...	...	8	117	7
Ste. Elizabeth.....	...	...	...	...	...	...	...	...	...	...	...	...	18	474	18
Cadieux.....	...	...	...	30	4	...	...	34	...	1	1	...	21	936	21
Mignonne.....	...	...	...	...	...	...	...	...	...	...	...	...	1	26	1
Ontario.....	...	...	...	...	...	...	...	...	...	...	...	...	28	543	28
St. Catherine.....	...	...	...	...	...	...	...	...	...	...	...	...	2	56	2
Champ-de-Mars.....	...	...	...	...	...	...	...	...	...	...	...	...	1	27	1
German.....	...	...	...	...	...	...	...	...	...	...	...	...	4	60	4
Sherbrooke.....	...	...	...	...	...	...	...	...	...	...	...	...	18	48	7
Marie Louise Avenue.....	...	...	...	...	...	...	...	...	...	...	...	...	2	45	2
Fortier.....	...	...	...	63	...	...	...	63	...	1	...	...	3	63	2
Grothée.....	...	...	...	...	...	...	...	...	...	...	...	...	1	39	1
Drolet.....	...	...	...	...	...	...	...	...	...	...	...	...	4	86	4
Total.....	83	...	...	30	67	...	...	180	2	...	1	2	...	4293	195





SCHEDULE showing the Pipes, &c., laid down.—Continued.

NAMES OF STREETS.	LENGTH IN FEET OF CAST-IRON PIPES.							NUMBER OF VALVES.				Hydrants.	Brick Chambers.	Houses Supplied.	Length of Lead Pipes in Feet.	Cocks.	
	Lead	12"	10"	6"	4"	3"	1½	Total.	12"	10"	6"						4"
<i>St. Mary's Ward.—Con.</i>																	
Brought forward.....					95			95			1	1		2	23	546	23
Visitation.....															4	70	4
Panet.....															59	746	50
Ontario.....					45			45					1	1	11	316	11
Seaton.....															32	553	32
Papineau Road.....				360	15			375					1	1	44	827	44
Parker Lane.....															2	38	2
Allard.....															15	188	15
Joachim Lane.....	79							79							4	82	4
Fullum.....					24			24					2	2	11	324	11
Marie Anna.....															11	177	11
Logan.....					7			16			1	1		2	7	129	7
Colborne Avenue.....															1	55	1
Sydenham.....															28	517	28
Dufresne.....				330	22			352					1	1	26	500	25
LaFontaine.....															2	23	2
Lane off Sydenham.....															2	33	2
Lane off Fullum.....															2	86	2
Lane off Ontario.....					378			378							26	395	26
3rd Lane off Fullum.....					298			298					1	1	8	112	8
Robb Terrace.....					144			144							6	162	6
Poupart.....															2	56	2
Mignonne.....	68							68					1	1	5	90	5
St. Mathieu.....					256			256					1	1	23	288	23



No. 11.—SCHEDULE showing the Pipes, Hydrants, and Valves laid down, and the number of Houses supplied with Water in the City of Montreal, up to 1st January, 1876.

WARDS.	LENGTH OF MAIN PIPES IN FEET.												NUMBER OF VALVES.												Brick Chambers.	Houses Supplied.				
																											Public.	Private.		
	30 in.	24 in.	16 in.	12 in.	10 in.	8 in.	6 in.	4 in.	3 in.	1½ in.	Lead.	Total.	30 in.	24 in.	16 in.	12 in.	10 in.	8 in.	6 in.	4 in.	2 in.	Total.								
East.....					3270	470	6070	6392			380	17182							7	18	3	34	30		62	629				
Centre.....					2556	408	5634	7880			850	17358							7	21	2	54	33	2	60	528				
West.....		630		965	4379	700	5721	10420	120		430	23365							4	10	23	3	44	37	75	720				
St. Anne.....				6787	15431	620	30479	50167			893	104367							1	2	4	1	1			2860				
St. Antoine.....		1060	2020	11020	7572	900	43596	91745			543	1405139863							2	1	16	7	3	61	131	11	270			
St. Lawrence.....				44	5562	3250	13741	28602			657	53856							1	3	3	21	46	5	79	390				
St. Louis.....				83	8034	1620	13721	30585	36		388	54417							2	6	1	14	41	5	69	82	144			
St. James.....				190	4778		23294	43413			732	73406							2	4		29	55		90	80	160			
St. Mary.....					5923		42147	33163			321	1233	87746						6			45	44	2	97	105	4	203		
Total.....	21000	1060	2650	19089	57525	7968	188403	306915	156	764	7028	591558	2	2	2	31	56	9	226	458	32	816	743	16	1500	31570				
Rising Main.....		26806		1674			15					49295							2			31			31	3				
Grand Trunk R. R., Point St. Charles							2383	2728				5111							2	3		5		10	15					
Montreal City P. R. Co., St. Mary								1015				1015										1			2					
Military Government at Hochelaga								2180				2180										1			1	2				
Grand Trunk R. R., St. Bonaventure								545				545										2			2					
Canadian Rubber Co., St. Mary								104				104										1			1					
St. Lawrence Glass Works, Dolisie								480				480										1			1					
Auger's Ship Yard on Canal Bank								127				127										1			1					
Bank of Montreal, Fortification Lane								47				47										1			1					
Merchants' Bank								18				18										1			1					
Montreal Telegraph Co., St. Sacrament								18				18										1			1					
Gazette office, Fortification Lane								20				20										1			1					
Fisher & Son, Wool Factory, Basin								108				108										1			1					
E. Chanteloup, Cold								18				18										1			1					
E. Chanteloup, Craig								27				27										1			1					
St. George Church, Stanley								79				79										1			1					
American Church, Drummond								49				49										1			1					
A. Cantin, St. Joseph								54				54										1			1					
Queen's Hall, St. Catherine								28				28										1			1					



No. 12.—SCHEDULE showing the Monthly Average Pressure in the City Mains during the year 1875.

MONTH.	At Water Works Shop, Lagauchetière street, corner of St. Charles Borromée Street.	Central Fire Station, Craig Street.	Fire Station No. 2, St. Gabriel Wellington Street.	Fire Station No. 3, Wellington Street.	Fire Station No. 4, Chaboillez Square.	Fire Station No. 5, St. Catherine Street.	Fire Station No. 6, Ontario Street.	Fire Station No. 7, Dalhousie Square.	Fire Station No. 8, Craig Street.	Fire Station No. 9, Centre Street.
1875										
January .....	59.00	66.00	46.00	72.00	65.00	39.00	50.00	54.00	69.00	.....
February .....	59.00	66.00	46.00	73.00	65.00	.....	51.00	54.00	52.00	.....
March .....	59.00	67.00	46.00	73.00	62.00	39.00	49.00	52.00	63.00	.....
April .....	60.00	65.00	42.00	75.00	63.00	41.00	56.00	52.00	68.00	.....
May .....	59.00	67.00	47.00	82.00	64.00	39.00	53.00	57.00	72.00	.....
June .....	59.00	66.00	45.00	77.00	64.00	38.00	50.00	52.00	66.00	.....
July .....	59.00	67.00	44.00	77.00	62.00	.....	47.00	52.00	67.00	.....
August .....	59.00	.....	.....	75.00	61.00	38.00	48.00	52.00	66.00	.....
September .....	59.00	67.00	44.00	75.00	60.00	39.00	48.00	52.00	67.00	65.00
October .....	59.00	68.00	.....	75.00	63.00	41.00	50.00	54.00	70.00	66.00
November .....	59.00	67.00	46.00	75.00	64.00	42.00	50.00	53.00	68.00	66.00
December .....	66.00	67.00	49.00	75.00	64.00	45.00	56.00	59.00	.....	70.00
Average 1875..	59.66	66.63	45.50	75.33	63.08	40.10	50.66	53.56	66.18	66.75
" 1874..	60.01	69.00	49.04	73.07	67.03	40.00	53.01	56.10	68.08	66.02

## MANAGEMENT.

No. 13.—STATEMENT shewing the various details of the EXPENDITURE on the  
MONTREAL WATER WORKS DEPARTMENT during the Civic Year 1875, ending  
1st January, 1876.

ADMINISTRATION.—	\$	cts.	\$	cts.	\$	cts.
AQUEDUCT.						
Repairs to Bridges and Fences .....	427	95				
Cleaning Ditches and repairing Banks .....	113	27				
Cutting Weeds .....	60	05				
Repairs to Scow and Boats .....	10	00				
Allowance for Keeper's Horse .....	100	00				
					711	22
WHEEL HOUSE.						
Repairs to Building .....	1437	10				
Work on Ground round the Buildings .....	26	55				
Supplies (including Fuel for Heating) .....	2498	30				
Repairs to Machinery .....	2501	25				
Sundries .....	50	00				
					6513	20
ENGINE HOUSE.						
Repairs to Building .....	26	45				
Supplies .....	3050	47				
Wages of Men running Engines .....	10428	79				
Fuel .....	21302	77				
Repairs to Machinery and Boilers .....	1249	53				
					36058	01
ENGINE HOUSE OF THE HIGH LEVEL RESERVOIR.						
Fuel .....	2345	18				
Supplies .....	60	26				
Wages .....	432	60				
					2838	04
TAIL RACE.						
Repairs .....					66	70
PIPE TRACK.						
Repairs .....					1801	64
RESERVOIR.						
Repairs to Valve House and Dwelling House.	158	14				
“ Walls, Fuel and Light .....	916	58				
(Coteau Baron) Repairs to Fence .....	134	00				
					1208	72

## HYDRANTS.

	\$	cts.	\$	cts.
Brought forward.....				
Inspecting and keeping in order.....			5080	64

## PUBLIC FOUNTAINS.

Repairs, Wages and Materials.....			586	41
-----------------------------------	--	--	-----	----

## METER DEPARTMENT.

Inspecting .....	693	84		
Testing and Repairing.....	561	17		
			1255	01

## DISTRIBUTION PIPES.

Thawing Pipes and Carting Water .....	12776	36		
Repairs to Valves, Mains, Services, &c.....	7658	02		
Inspecting Services inside Houses .....	711	00		
Repairs to Streets and Footpaths .....	4416	51		
Distributing Water and keeping Puncheons at Fire Stations.....	1056	65		
			26618	54

## SHOP DEPARTMENT.

Mens' Wages (Turncocks) .....	8014	82		
Iron and Timber.....	548	45		
Repairs to Buildings .....	120	30		
Sundries, Coal and Wood for Fuel .....	1299	02		
Instalment on Shop.....	800	00		
Tools, Spikes, &c.....	305	78		
			11088	37

## MISCELLANEOUS.

Staffs' Salaries.....	9240	00		
Stationery and Printing of Reports.....	575	80		
Superintendent's Horse Keep.....	400	00		
Contingents .....	659	99		
School Taxes and Assessments.....	115	51		
Map for Distribution Pipe.....	949	60		
Damages.....	2711	27		
			14652	17

## LOANS—

108478 67

## PIPE LAYING.

Cast Iron Pipes.....	91991	82		
Lead Pipes, Pig Lead and Tin.....	13983	57		
Valve and Service Stones .....	1067	10		

Carried forward.....

	\$	cts.	\$	cts.
Brought forward.....				
Special Castings, Hydrants and Stop-cocks..	26264	06		
Brass Works .....	3596	55		
Planks for Boxes, &c.....	1605	15		
Wages.....	60772	26		
Bricks .....	1841	00		
Cement and Lime.....	430	24		
Coals .....	280	28		
Planks for Footpaths .....	3309	93		
Iron for Picks and Straps.....	1277	27		
Tools and Sundries, &c.....	2247	50		
Drain Pipes, &c. ....	2771	47		
30-inch Main Pipes, Wages, Materials, &c...	59057	23		
			270495	46
Cleaning of Aqueduct.....			576	43
Land for New Cut .....			4874	90
Girders for Bridge at Entrance .....			3621	00
Gates " " " .....			7031	30
New Cut, 1st Section.....			104185	89
Worthington Engine.....			9886	42
Extension of McTavish Street Reservoir....			32552	80
High Level Reservoir.....			39662	96
Engine House, High Level Reservoir.....			18808	43
Atwater Avenue .....			21011	01
Work Shop at Wheel House.....			6015	67
Coal Shed.....			13476	80
New Boilers at Engine House.....			528	25
Meters.....			6584	50
Finance Department—Advertising, Sta- tionery, &c. ....			2097	89
Inc Supply, Draughtsmen's Offices, &c....			996	91
Reserved Fund—Assessment paid to out- side Municipality.....			150	00
			542556	62
			<u>\$651035</u>	<u>29</u>



## No. 14.—INVENTORY OF STOCK, JANUARY, 1876.

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LEAD PIPES AND OTHER LEAD.			
62660 lbs.	$\frac{1}{2}$ inch	Lead Pipe.	1200 lbs Pig Lead.
8680	" $\frac{5}{8}$	" "	
34712	" 1	" "	

---

61 assorted pieces to raise Hydrants	9 Hydrant Posts
18 Seats for Hydrants.	1000 Service Plates.
69 Hydrant Covers *	46-2 Nozil Hydrants.
22 " Frames.	5-4 " "
9 Valve Covers and Plugs.	2 American "
	4 Branches for 4 Nozil Hydrants.

\* 2 for 4 Nozil Hydrants.

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18 Brass Spindler assorted.	36 Hydrant Nozils.
1 " Cut off.	14 Fountain Jets.
23 Hydrant Washers.	3 Peet Valves.
69 " Nuts.	

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320 Hydrant Couplings for Watering Streets.  
 53 Assorted Brass Couplings for iron pipes.  
 18 " " Stop Cocks for iron pipes.  
 3 Cast Iron Horse Troughs.

## INVENTORY OF STOCK, JANUARY, 1876.

	30 in.	24 in.	16 in.	12 in.	10 in.	8 in.	6 in.	4 in.	3 in.
Cast Iron Pipes in feet...	2637	408	540	711	7399	1152	24804	24192	800
Sleeves .....	24	28	6	17	27	25	5	31	3
Elbows .....				8			13	5	
Double Bends .....							6	8	
Caps .....			3	23	2		68	35	4
Plugs .....	3	5	6	31		6	16	17	7
Valves .....		5	3	9	1	11	34	13	10
	30x30								
Fork Pipes .....	5			4	4		4		
	30x24								
Do .....	2								

\* 1716 ft. damages.    † 1600 ft. damages.    ‡ 160 ft. damages.  
§ Old.

	30x24	24x16	16x12	12x10	10x8	10x6	6x4	4x3					
Taper Pipes .....	3	1	2	3	1	8	9	12					
	30x12	30x6	12x12	12x10	12x6	12x4	10x8	10x6	10x4	8x6	6x6	6x4	4x4
Cross Branches .....	5	6	14	6	3	9	1	5	26	5	4	14	4
	30x12	30x6	24x4	12x12	12x10	12x6	12x4	10x8	10x6	10x4	8x4	6x6	6x4
Single Branches .....	6	1	14	6	1	3	10	1	12	11	3	22	11

WORK SHOPS ON ST. CHARLES BORROMÉE STREET.  
BRASS WORKS.

	1 in. x 1	1½ inch.	1 inch	¾ inch.	½ inch.
New Stop Cocks with Couplings .....					
Old " without " .....		16	66	19	
New Elbows with " .....			194	205	1771
Old " without " .....		14	17	32	
Single Joints .....			277	600	290
Three-Way Branches .....				492	
American Nozzl. ....				45	
* Four Way Branches .....					
Tees .....	117			376	

\* Assorted old ones.

No. 15.—SCHEDULE showing the number of Assessed Dwellings, Stores, Shops, Offices, Warehouses, Manufactories, Hotels, &c., in the city of Montreal for the year 1875—1876 with the Assessed Water Rates thereon.

Number Assessed.	Tenanted.	Vacant and not supplied.	Yearly Rate.	Number Assessed.	Tenanted.	Vacant and not supplied.	Yearly rate.
1912	1761	151	\$ 5 00	21626	21128	498	
3312	3180	132	5 75	116	116	.....	\$23 75
3397	3220	77	6 50	17	17	.....	24 50
3405	3361	44	7 25	282	279	3	25 25
1940	1929	11	8 00	49	49	.....	26 00
1498	1489	9	8 75	173	169	4	26 75
644	644	5	9 50	92	92	.....	28 25
1238	1222	16	10 25	16	16	.....	29 00
132	121	.....	11 00	156	156	.....	29 75
875	864	11	11 75	5	5	.....	31 50
109	109	.....	12 50	258	254	4	32 75
581	575	6	13 25	1	1	.....	35 75
217	213	4	14 00	98	97	1	36 50
483	480	3	14 75	2	2	.....	37 75
42	42	.....	15 50	1	1	.....	38 75
373	362	11	16 25	188	186	2	40 25
50	43	7	17 00	3	3	.....	41 75
677	677	.....	17 75	18	18	.....	44 00
14	14	.....	18 50	70	69	1	47 75
219	217	2	19 25	37	37	.....	52 25
12	12	.....	20 00	3	3	.....	53 00
371	363	8	20 75	5	4	1	59 00
17	17	.....	21 50	16	16	.....	70 25
98	97	1	22 25	2	2	.....	74 75
10	10	.....	23 00	17	17	.....	92 75
				1	1	.....	452 75
21626	21128	498		23257	22743	514	

**SCHEDULE showing the number of Assessed Dwellings—Continued.**

**STORES, SHOPS, OFFICES, &c.**

Number Assessed.	Tenanted.	Vacant and not supplied.	Yearly Rate.	Number Assessed.	Tenanted.	Vacant and not supplied.	Yearly Rate.	Number Assessed.	Tenanted.	Vacant and not supplied.	Yearly Rate.
381	357	24	\$ 4 00	3641	7	7	\$28 00	4248	4089	159	\$98 00
413	389	24	5 00		4	4	29 00		4	4	102 00
727	702	25	6 00		49	48	30 00		6	6	110 00
178	171	7	7 00		9	8	31 00		5	5	114 00
260	249	11	8 00		16	15	32 00		9	8	118 00
91	88	3	9 00		90	85	34 00		2	2	122 00
436	419	17	10 00		9	9	36 00		1	1	132 00
31	30	1	11 00		46	46	38 00		7	7	140 00
173	166	7	12 00		141	140	42 00		4	4	142 00
29	29	....	13 00		3	3	44 00		4	4	146 00
267	255	12	14 00		8	8	46 00		1	1	158 00
10	10	....	15 00		4	4	48 00		11	11	162 00
57	56	1	16 00		81	81	50 00		1	1	194 00
25	25	4	17 00		8	8	54 00		2	2	202 00
210	206	1	18 00		28	28	58 00		2	2	210 00
6	5	1	19 00		4	4	60 00		2	2	242 00
32	31	....	20 00		19	19	62 00		1	1	290 00
2	2	....	21 00		24	24	66 00		3	3	322 00
162	153	9	22 00		4	4	70 00		1	1	362 00
7	7	....	23 00		21	21	74 00		1	1	478 00
9	9	....	24 00		25	25	82 00		1	1	482 00
4	4	....	25 00		4	4	88 00		1	1	522 00
131	128	3	26 00		3	3	90 00		1	1	602 00
3641	3491	150		4248	4089	159		4325	4164	161	

## RECAPITULATION.

	Tenanted.	Vacant.	Totals
Dwellings.....	22,743	514	23,257
Stores, Shops, Offices.....	4,164	161	4,325
Hotels and Taverns .....	234	...	234
	<hr/> 27,141	<hr/> 675	<hr/> 27,816
Engines .....			114
Special Charges on Manufactories, &c.....			131
Horse Stalls....			949
Water Closets.....			5511
Urinals .....			502
Horses.....			3130
Cows.....			503

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*Water Rates Collected by the Water Department during the civic year,  
ending the 31st December, 1875.*

For Buildings.....	\$282,229.30
“ Water Closets.....	18,607.00
“ Urinals .....	398.00
“ Horses.....	5,478.00
“ Cows .....	322.00
“ Horses Stalls.....	1,006.00
“ Steam Engines.....	4,280.00
“ Permits for Hoses to Water Streets, &c.....	262.00
“ Permits for Building purposes .....	2,170.00
“ Private Fountains.....	160.00
“ Bakeries.....	784.00
“ Water supplied through meters within City limits.....	8,979.79
“ Tenants outside the City limits.....	2,675.85
“ Factories, &c.....	2,305.00
“ Rent of Meters inside City \$52.63, outside City \$179.37...	232.00
	<hr/> \$313,088.94
Arrears .....	17,396.35
	<hr/> \$330,485.29

## No. 16.—HOTELS AND TAVERNS.

Number Assessed.	Tenanted.	Vacant and not supplied.	Yearly rate.	Number Assessed.	Tenanted.	Vacant and not supplied.	Yearly rate.	Number Assessed.	Tenanted.	Vacant and not supplied.	Yearly rate.
60	60	..	\$12.00	187	187	..	\$42.00	223	223	..	\$82.00
40	40	..	17.00	19	19	..	47.00	3	3	..	102.00
58	58	..	22.00	12	12	..	52.00	3	3	..	122.00
18	18	..	27.00	1	1	..	57.00	2	2	..	142.00
11	11	..	32.00	3	3	..	62.00	1	1	..	352.00
187	187	..		223	223	..		234	234	..	

HORSES.		COWS.		STALLS.		UINALS.	WATER CLOSETS.	
No.	Rate.	No.	Rate.				No.	Rate.
3130	\$2.00	503	\$1.00	584	\$1.00	502	86	\$2.00
				365	2 00		254	3.00
							5119	4.00
							52	15.00
3130		503		949		502	5511	

SCHEDULE showing the number of Dwellings, &c.—(Continued.)  
SPECIAL RATES.

BAKERIES.		BEER BOTTLERS.		FOUNTAINS.		FACTORIES.		STEAM ENGINES.			SUNDRIES.	
No.	Rate.	No.	Rate.	No.	Rate.	No.	Rate.	No.	Horse Power.	Total.	No.	Rate.
2	\$5.00	6	\$5.00	19	\$5.00	6	\$10.00	3	1	1½	6	\$ 5.00
1	6.00	1	10.00	1	6.00	1	14.00	2	1	2	1	6.00
1	8.00	2	12.00	1	8.00	4	15.00	11	2	22	2	15.00
1	9.00	1	14.00	1	9.00	2	20.00	18	3	54	1	24.00
4	10.00	1	15.00	1	10.00	1	22.50	14	4	56	1	60.00
5	12.00	1	20.00	1	12.00	1	25.00	10	5	50	1	300.00
8	15.00	1	24.00	2	15.00	9	30.00	20	6	120	1	600.00
12	20.00	1	35.00			1	40.00	3	7	21	1	750.00
2	25.00	1	30.00			1	42.00	6	8	48		
1	28.00					1	55.00	3	9	27		
4	30.00					1	90.00	6	10	60		
2	35.00							4	12	48		
2	37.50							2	14	28		
2	40.00							3	15	45		
1	42.00							1	16	16		
								1	18	18		
								5	20	100		
								1	30	30		
								1	40	40		
48		15		26		28		114		786	14	

No. 17.—WATER RATES COLLECTED FROM THE YEAR 1867 TO 1874 INCLUSIVELY.

Year	Assessed Water Rates.	Reduc- tions.	Discount	Total available.	Collec- tions.	Arrears.	Collec- ted in 1868.	Collec- ted in 1869.	Collec- ted in 1870.	Collec- ted in 1871.	Collec- ted in 1872.	Collec- ted in 1873.	Collec- ted in 1874.	Collec- ted in 1875.	Total arrears collected	Out- standing 31st Dec. 1875.
1867	\$ c. 249730.18	\$ c. 7694.78	\$ c. 6897.36	\$ c. 235128.04	\$ c. 200414.13	\$ c. 34713.91	\$ c. 11428.03	\$ c. 157.60	\$ c. 2.25	\$ c. .....	\$ c. .....	\$ c. .....	\$ c. .....	\$ c. .....	\$ c. 11587.88	\$ c. 23126.03
1868	\$ c. 258168.11	\$ c. 10137.14	\$ c. 7061.72	\$ c. 240989.25	\$ c. 207164.10	\$ c. 33805.15	\$ c. .....	\$ c. 11408.36	\$ c. 74.50	\$ c. 17.25	\$ c. .....	\$ c. .....	\$ c. .....	\$ c. 7.25	\$ c. 11507.36	\$ c. 22297.79
1869	\$ c. 265581.85	\$ c. 14298.18	\$ c. 7540.55	\$ c. 244023.12	\$ c. 210999.91	\$ c. 33723.21	\$ c. .....	\$ c. .....	\$ c. 11264.24	\$ c. 25.00	\$ c. 42.25	\$ c. .....	\$ c. .....	\$ c. .....	\$ c. 11331.49	\$ c. 23391.72
1870	\$ c. 273378.97	\$ c. 16678.98	\$ c. 7926.11	\$ c. 245773.88	\$ c. 215384.87	\$ c. 33389.01	\$ c. .....	\$ c. .....	\$ c. .....	\$ c. 9994.93	\$ c. 148.58	\$ c. 49.75	\$ c. .....	\$ c. .....	\$ c. 10193.26	\$ c. 23195.75
1871	\$ c. 284584.52	\$ c. 14248.39	\$ c. 7957.47	\$ c. 262378.66	\$ c. 228308.80	\$ c. 34069.86	\$ c. .....	\$ c. .....	\$ c. .....	\$ c. .....	\$ c. 10236.41	\$ c. 313.40	\$ c. 10.25	\$ c. 12.85	\$ c. 10572.91	\$ c. 23496.95
1872	\$ c. 305693.10	\$ c. 14130.70	\$ c. 8765.58	\$ c. 283706.82	\$ c. 247892.46	\$ c. 34814.36	\$ c. .....	\$ c. .....	\$ c. .....	\$ c. .....	\$ c. .....	\$ c. 10719.12	\$ c. 147.50	\$ c. 18.00	\$ c. 10684.69	\$ c. 23929.74
1873	\$ c. 337442.87	\$ c. 8139.21	\$ c. 10098.55	\$ c. 319205.11	\$ c. 274637.11	\$ c. 44548.00	\$ c. .....	\$ c. .....	\$ c. .....	\$ c. .....	\$ c. .....	\$ c. .....	\$ c. 13814.54	\$ c. 1423.28	\$ c. 15237.82	\$ c. 29310.18
1874	\$ c. 374312.64	\$ c. 14213.29	\$ c. 11803.45	\$ c. 345295.90	\$ c. 297245.13	\$ c. 51050.77	\$ c. .....	\$ c. .....	\$ c. .....	\$ c. .....	\$ c. .....	\$ c. .....	\$ c. .....	\$ c. 15889.67	\$ c. 15889.67	\$ c. 35161.10
						\$ c. 300114.27	\$ c. 11428.03	\$ c. 11565.96	\$ c. 11340.99	\$ c. 10037.18	\$ c. 10427.24	\$ c. 11082.27	\$ c. 11872.39	\$ c. 17543.00	\$ c. 97205.01	\$ c. 202909.26

CITY HALL

Montreal, March 1876.

CHAS. LAPIERRE,

Accountant, M. W. W.

REPORT  
OF MESSRS.  
K. W. BLACKWELL & J. D. BARNETT,  
MECHANICAL ENGINEERS,  
UPON THE STATE OF THE  
MACHINERY OF THE PUMPING WORKS,  
OF THE  
MONTREAL WATER WORKS.

---

TO J. W. MCGAUVVRAN, ESQ.,

*Chairman of Committee of Montreal Water Works,*

DEAR SIR,

We herewith beg to hand your Committee our Report on the whole of the Machinery and Boilers in use for pumping water for the City of Montreal, and to state that the Report is made in exact compliance with the minutes passed by your Committee, February 12th and February 22nd 1876.

*1st—Contract made about 25 years ago with Sir William Fairborn of Manchester, for a pair of Breast Wheels and set of three Pumps connected to each..*

In this transaction, the Makers were not restricted by the Corporation in design or details, by any drawings or specifications, therefore, we are unable to pass an opinion as to the carrying out of contract, and must confine our opinions to the present condition of the same.

The original three throw cast iron Crank shafts, after showing signs of weakness, were replaced with wrought iron.



One of the above mentioned Breast wheels has lately been taken out and replaced by a Turbine wheel, which is now connected to the original Cranks, Pumps, &c. The remaining Breast wheel together with the wrought iron Cranks, Pumps, connections, &c, gives every evidence at the present moment of sound and substantial workmanship, when, however; the Pumps are seen under duty, the motion is somewhat unsteady and irregular, due to general arrangement of the whole, and not to any defect in workmanship or material, the main bearings of connecting rods also the Pump glands show the result of long usage, and require some repairs, which being done, however, would render them capable of many years more service, so that if the remaining Breast wheel was also replaced by a Turbine, the whole of this machinery would be in a highly satisfactory and efficient condition.

---

2nd—*McDougall's contract for No. 1 Turbine and two Pumps, 1864.*

The whole of this machinery has been built in accordance with plans and specifications, except in some minor points where alterations have apparently been made while work was in progress, to the general improvement of the whole arrangement, and also more recently an alteration perfecting the gearing for working the gates below the Turbine, which brings this operation under the certain and immediate control of one man.

When this machine was examined under full duty, the smooth and even working of the Turbine wheel gave convincing proofs of the sound and substantial style of its construction and setting. But we found in the motion of the main horizontal shaft, a very decided and damaging "Pound" or "Lurch," which occurred at each end of the stroke of the pump. This "pound" which is more marked at the western end of this shaft than the other, may have been occasioned by the fact that the western abutment or stone foundation to which the machinery is attached could

not be built with the same proportions and advantages as the other abutment, owing to the position of the Turbine wheel, the above mentioned irregularity of motion has loosened the two top courses of this abutment, and until a general bracing up of abutment and lining up of main shaft has been carried out, this piece of machinery could not be called satisfactory.

We observed that when these pumps were running their normal speed, 13 double strokes per minute, that the upright journal of Turbine shaft as well as journal of main shaft were running warm, possibly due to the irregularities of motion as described.

An alteration was made in 1874, by the Corporation, upon the original design of cross-head connections which we are informed is giving greater satisfaction than original arrangement, but we noticed a decided movement and want of stability about the guides, caused by an insufficient number and injudicious arrangement of the bolts that secure the guides to main frame.

The main bed or frame is a good piece of work and well secured to foundation.

The pumps work well and appear to give every satisfaction, one of the pump barrels is however strengthened and tied together by wrought iron bands but at present is quite effective.

The covers of valve chests are not sufficiently strong and stiff to stand the intermittent pressure put upon them without springing and vibrating to such an extent that great difficulty is found in keeping these joints tight, the leakage resulting from this source is damaging to other portions of the machinery and to the foundations generally. These covers might readily be replaced by others of an improved design and increased strength which would obviate the above defect.

All other joints on " Pump," and "Air Chamber" connections, and main leading therefrom are in good order and up to requirements of specification.

3rd—*High pressure double cylinder engine added to Turbine by Bartley in 1872.*

In this piece of work the specifications have been adhered to, with the following exceptions. The steam pipe is 6 " in diameter whereas the specification requires it to be 8 " in diameter. For a distance of about 35 feet the Contractor has neglected to cover this pipe with a non-conducting material as required in specifications. The joints of this steam pipe are also made with India Rubber, which is not in our opinion up to the standard of first class work.

The Eccentric straps are made of iron, whereas the drawing shows them to be of brass.

The Slide Bar Block have been altered from the original plan, which alteration, in our opinion, cannot be considered an improvement, the specification however gives the Contractor the privilege to modify the details at his own discretion, but at the same time binding upon the Contractor the responsibility of the engine fulfilling the duty required.

The other portions of this engine are of fair workmanship, and fulfill the requirements of specification.

We requested the Superintendent of Water Works machinery to run this piece of machinery, so that we could observe it's working under full duty and were informed that it would take a fortnight to get it in working order. We were desirous of seeing this Engine under duty, because from it's general arrangement we did not form a very favorable impression of it's practical and economical utility.

---

*McDougall's contract for Air Chamber Bases.*

These castings were put in by the Contractor in 1866, underneath the original Air Chambers, supplied by Sir Wm. Fairborn some 25 years ago to supply the place of the original " Air Chamber Bases " which had become broken by the concussion of the pumps. We examined

these castings (one of which is connected to the pumps of No. 2 Turbine and the other to the old Breast wheel) both inside and outside, above and below, in a careful manner, and we found the upper portion of these Air Chambers, which are the original castings as supplied by Sir Wm. Fairborn, to be sound in every respect and showing no signs of weakness. We also find the two Bases as furnished by Mr. McDougall to be perfectly "clean," "sound," castings, of very creditable workmanship, having joints all made "metal to metal" and water tight under pressure, the whole casting in each case being securely fastened to the carrying girders, no motion being perceptible when pumps were under heavy duty. The castings are fully up to the requirements of the specifications, as regards their size, strength, and finish, also as regards their capacity for the duty required of them, and in the small point wherein they differ from the plan, they fully agree with the more exact specification, these two documents not being in exact accordance with one another.

On making an internal examination of these Air Chambers, we find that there is a patch in the base that is connected to the pumps worked by No. 2 Turbine, this patch has been put on from the inside of casting, between the crossed strengthening ribs, as shewn by attached sketch, the dimensions on which were accurately taken by ourselves while inside the Air Chamber. This patch has been well and carefully fitted into its position and has an even and solid bed, hot lead has been run all round the jointing and carefully caulked, which makes it perfectly tight. We tested it severely by striking it with a heavy "flogging hammer" but could not detect any movement or vibration, nor any sound of hollowness whatever, and when the full working pressure was on, there was no sign of leakage about it, although we carefully looked for leakage from underneath.

In fact the defect is so small that it is now rusted up and cannot be seen when looking at the underside of the base plate.

With regard to its present efficiency for duty, we would remind you that the strength of this base plate lies chiefly in its deep cross ribs, rather than the plate itself, so that as long as there is no defect in these ribs, there might be even *several small holes* in the thick plate itself, without it having any appreciable effect in weakening the whole base, or increasing the chances of failure by fracture.

Thus, although there is a "flaw" or "blow hole" from which the specification requires it shall be free, yet in our opinion the defective casting, as now patched is of equal strength and quite as reliable as the other Base in which no flaw can be detected.

The Reflux Valves which also form a portion of this contract fully comply with specifications and drawings, and are in perfect working order on both Air Chambers, also the ingenious contrivance for working the gate motions of both Wheel and No. 2 Turbine by small right and left Turbines instead of manual labour, is well done, perfect in its action, neatly finished, and in strict accordance with the specification and plans, the same is to be said of the relief valve, a portion of the same contract.

---

*Steam Pumping Engine No. 1 with four Boilers by W. P. Bartley, 1868.*

The design as laid down in general specification has been carried out and adhered to. But in the matter of workmanship and finish we do not consider that the general intention of the specification and contract has been acted up to, to wit:

The whole of the engine frame castings are rough and poorly finished, the upper frame of Engine has been put together considerably out of line, numerous liners have been used in joints of frame and most of the bolts that tie the several portions of frame together are not a good solid fit, also the general design of the framing, the bracing and the "staying" is not sufficient for the duty required of it.

On this Engine, the 44" low pressure piston and air pump with all connections being coupled at one end of walking beam and having at the other end the much lighter 26" piston has the effect of causing a great irregularity of movement during each revolution, this irregularity of movement is augmented and aggravated by want of stiffness in the whole of engine frame.

Since delivery into the hands of Corporation the Crank Pedestal has been much strengthened, the position and weight of Fly Wheel on shaft altered to secure greater steadiness of motion.

These vibrations in Frame, Beam, Crank and Crank Shaft and Cross heads are of course elements of danger to the life of metal, also to the general efficiency of Engine, therefore a constant working of this engine would not be safe.

We saw one broken Crank pin and were informed by the Engineer that they have often broken.

The Pumps, Air Chambers, and Valves below this Engine are of first class workmanship and well secured to foundation.

The alterations made to Pump plungers and Valve Chests under contract with W. P. Bartley in 1873, have been well carried out and the arrangement is an improvement on the original design, this contract also included the same alterations on the Gilbert Engine, which has been equally well carried out.

---

*Steam [Condensing] Beam Engine by E. E. Gilbert, 1871.*

This engine has been built in accordance with specification, with the exception of some minor constructive details having been altered from the plans with a view to improving the general efficiency. We found the workmanship and material to be very good, the general design being well calculated to resist the various strains put upon it in doing the duty required.

When this Engine was run for our inspection it w

noticed that one of the main brasses had been keyed up too tight, causing slight heating of the Crank pin journal. After this was remedied Engine moved with great precision, ease and steadiness, while making its normal speed.

The Pumps, Valves, and Air Chambers, and in facts all connections below this pump are of first class workmanship and material. All castings being good and joints tight.

---

*Contract for replacing Breast Wheel by Turbine—By W. P. Bartley, 1872.*

This contract has been carried out with a most thorough and rigid adherence to drawings and specifications all castings and other materials are sound, and workmanship throughout is excellent, all joints are water-tight and when the whole machinery is in motion, there is no vibration whatever and the interworking of the toothed wheels is very correct and smooth.

The whole of this "driving" machinery is unusually well arranged, and is at the present day in excellent condition, but the Pumps and Cranks to which they are attached are the original Pumps supplied with the Fairborn machinery some twenty years and require some repairs as previously stated in this report.

---

*Duplex Steam Pumping Engine by Worthington, 1875.*

In the terms of the contract and specification for this Engine the builders were simply bound to supply an Engine with Pump of equal proportion, finish, and workmanship as that supplied by the same firm to the Town of Belleville, N. Y.

Having seen the Worthington Engine, at Toronto, and similar Engines of the same type, we feel quite confident in assuring your Committee that they have, in this case, been supplied with an equally efficient Engine and very perfect in its workmanship and neat finish, which

will undoubtedly give the best results in economy of maintenance, repairs and consumption of fuel. This opinion, however, we cannot support with any figures, as the question of the "actual duty" of Engines, and "consumption of fuel," did not lie within the instructions received from you.

It is possible that the presence of India Rubber Valves in the condensing apparatus may cause a little trouble or their frequent renewal, but this is a very small matter in a machine otherwise so perfect and complete.

---

*Four Lancashire Boilers, by W. P. Bartley, 1868.*

In the building of these Boilers, the general form, thickness of plates, and dimensions required by specification have been adhered to.

With regard to the material used in plates, we are unable to speak positively. The amended specification requires that all plates that come in contact with the fire, shall be "Lowmoor," we were quite unable to find any brands or any part of these Boilers except in two instances, viz: the large dome on No. 1 Boiler was stamped with a Crown [common "Staffordshire"] also the manhole dome of No. 1 Boiler was stamped with a "Lowmoor" stamp.

We do not condemn the iron in Belly of Boiler, as not being "Lowmoor" as per specification, because we were unable to find brands, for the finding of such brands in a Boiler that is in service and set in brickwork would be accidental. But we have asked Mr. Lesage to submit for our examination, portions of the plates, that have been cut out for repairs, we shall then be able to judge from its quality if it is "Lowmoor" or equal to that brand in strength.

The quality of iron in the upper part of shell is fairly good in quality, not first class, but of quite sufficient tenacity and strength for the working pressure. We were enabled to judge of the quality of this iron by examining the plate at the point where holes for steam way to Dome have been cut.



In workmanship these Boilers are hardly up to the standard of what we consider first class work and finish, as required by specification, to wit:—The caulking inside of Boiler is not been thoroughly done, Rivet holes in some instances come too near the edge of plate. The arrangements of the position of Tubes in Tube sheet has been very irregular; the last fault has the effect of augmenting the difficulty of bad circulation of water, which itself has been caused chiefly by a want of sufficient space between tubes. In consequence of this, the action of the fire on the Belly sheets has been, and still continues to be most severe, and portions of them have been renewed several times by patching, which is very unsatisfactory; and under existing conditions, this portion of these Boilers will eventually have to be renewed. This process of deterioration need not however be any cause for alarm while working at the present pressure (40 lbs.), for the reason that these points will develop excessive leakage long before Boiler becomes weakened. We would recommend your Committee to adopt the following course with these Boilers:—1st, To remove one vertical row of tubes, to improve circulation of water; secondly, to put them on lighter duty as regards the amount of steam to be generated by them; and as a precautionary measure, we would also advise your Committee to have the staying of Main Dome altered, the present arrangement being wrong in principle, unreliable and insecure at the present moment.

The staying also of the Back Tube sheet is poorly arranged, although strong enough for the now working pressure (40 lbs.)

The inside of these Boilers are at the present time free from incrustation, and are apparently well washed out and taken care of.

The Tubes are clean, of sound metal, and well fitted into the end sheets—really an excellent job.

The plan pursued in these Boilers—of conducting the return flue over the top of shell of Boiler, where no water is in contact with plates—is to be condemned, as having

the effect of impairing the strength and tenacity of the metal.

All the joints on steam pipes, valves and man-holes, of these and all other Boilers examined, are made with India Rubber, which is unreliable, and is often found to corrode the surfaces to be jointed, although no signs of rusting were to be seen on those joints that were separated. Very few of these joints, so made, were tight under hydraulic pressure of 68' lbs. an increase only of 7-10' over their ordinary working pressure.

We would recommend that the lever for carrying the weight on safety valve be made only just long enough to give the full pressure when the weight is at the extreme outer end. As arranged at present, the weight might carelessly be moved so far on the lever as to almost double the ordinary pressure before the valve would lift from its seat.

---

*Two Lancashire Boilers, by E. E. Gilbert, 1871.*

The specification for these Boilers with regard to form, dimensions and thickness of plate, has been adhered to.

The specification requires all plates to be of "Low-moor" iron, but we were unable to discover on any portion of these Boilers any Brand or Mark whatever, although we searched diligently for them on the inside surface of plates, as well as outside; such a coincidence as none of the Brands being in sight is, however, quite possible.

A portion of the Belly of one of these Boilers has been cut out for repairs, and we also have requested to have this piece submitted to us for inspection.

The specification requires the Contractor to use the widest plate that can be procured. We find the Barrel plates are only 3 ft. wide.

The Dome Crown in these Boilers are a good job, well and sufficiently stayed, as also are the end plates of Barrel. The tubes are arranged in the same manner as the four first boilers; and though a good piece of work in

themselves, seriously interfere with the proper circulation of water on underside immediately over the furnace. We would advise the complete removal of several tubes in the centre of bottom rows, and also the placing of them on lighter duty as regards the amount of steam to be generated by them.

---

*Test of Six Boilers by Hydraulic Pressure.*

The test pressure was 68 lbs. on the square inch, this being the greatest pressure the height of the reservoir would give.

No. 1 proved quite tight under the test. In No. 2, some of the old plate joints and the patch joints immediately over the furnace leaked slightly.

No. 3 leaked at the same joints as No. 2, but they were defective for a much higher distance up the sides of barrel. The joints of the several patches come unnecessarily close on this boiler.

No. 4 leaked only at the patches over furnace.

No. 5 and 6 Gilbert Boilers shewed no sign of leakage; the whole of these six Boilers are reliable to work at 40 lbs., and will continue to give satisfaction if our suggestions regarding reducing their duty, etc., are carried out.

---

*Three Cornish Boilers, May, 1872 — No. 1, by McDougall;  
No. 2, by Bartley; No. 3, by Gilbert.*

The Boilers agree in dimensions and arrangement with the specification and plans, but no brands or marks can be seen, after a most careful inspection—the iron to appearance being of good quality.

Dome crowns and End sheets of barrel are well and securely stayed. Flues are strengthened by three rings of light angle iron instead of Tie iron, as called for in specification.

The fittings, cast-iron fronts, grates, doors and dampers, are as specified; but the man-hole covers, at least in Nos. 1 and 2, are not ground joints as required. The 4 ft. domes are an excellent piece of work, turned out of one plate and double rivetted. The rivetting all through is

first-class machine work. There is a mistake in placing the longitudinal joints of one flue in No. 1, so that every alternate one is at top of flue, and thus exposed to the most intense heat; they should have been placed below. No. 3 is the best of this battery: it is in better condition, and shows more forethought in construction, care in manufacture, rivetting and caulking, than any other. It is the only boiler having a double line of rivets on the horizontal end sheets. No. 1 shows two slight cracks inside the roof of turned flange of dome crown, but they are not dangerous, and stood the test unmoved. The occurrence of these cracks would suggest that it would have been a better plan to have adopted the use of "Low-moor" or Charcoal Iron plates in the making of these furnace flues, instead of Staffordshire plate as allowed by specification.

Under a test pressure of twice the ordinary working strain, viz., 80 lbs., obtained from the small "Worthington" Donkey Pump, Nos. 1 and 3 proved to be in perfect condition, but No. 2 developed two small cracks in one flue just above and forward of the fire bridge.

#### *High Level Water Service, 1875.*

We can only report on the present condition of this work, as there were no plans or specifications prepared by the Corporation for this work. The engine (one of Worthington's High Pressure Duplex) is a most satisfactory machine, of solid construction, neat finish, working smoothly, regularly, and under perfect control; in fact, the workmanship and material is quite equal to that of the large compound engine supplied by the same maker.

The single Boiler has several defects; it is only single rivetted on the longitudinal seams, and should be double. The tubes are spaced too close to each other, and to the barrel at underside, immediately over the furnace, to make a joint between the wrought iron plate and cast iron ring at top of dome a liner has been used about 5-16 in. thick and 14 in. long; this is very poor work. Dome joints are only single, and should be double rivetted. Steam pipes are left uncovered.

No Brands or Maker's marks could be found on the plates, but it appears to be of fair quality; the same may be said of the rivetting. The end sheets of barrel are well

and sufficiently stayed. The tubes are good, but they have been roughly fitted into the end sheets. The whole proved perfectly water-tight under a test pressure of 89 lbs., which is an increase of almost 4-5 over the working pressure, and all that the high level pressure would give us. It is quite sufficient for the pressure at which it is worked, viz., 50 lbs. per square inch.

---

*Boiler Power.*

In answering your enquiry respecting increase of Boiler power, we would say, that after examining the whole of the nine boilers for the Low Level Service, under duty together, and trying what work portions of the whole set would do, we would advise that the power be increased about 35 per cent., or say 3 new boilers of equal capacity to the last set of the Cornish type. This would then allow you, in case of a total failure of Water Power, to run the Worthington Duplex and either one of the Beam engines, or the High Pressure engine applied to the pumps of No. 1 Large Turbine. It would give you the power to do this, and what is equally necessary, it would at the same time allow one of them to stand idle and cold while being cleaned inside and out (a point too often neglected where boilers are being worked up to their highest capacity), it would permit of any small repairs required being done at once, before permanent injury was done. It would take away any necessity for forcing fires, and thus the fuel would be burnt economically. There are strong signs that the 1st battery of six boilers have been at one time unduly forced in the endeavour to get from them a higher evaporative duty than their construction and faulty arrangements would readily and cheaply permit; and this, of course, would have been avoided had there been sufficient boilers to do the work with ease.

---

In conclusion, we must express our thanks to your Superintendent, Mr. Lesage, and his staff, for the ready willingness with which all assistance, information and documents required by us, were supplied.

K. BLACKWELL,

*Asst. Loco. Supt.*

J. DAVIS BARNETT,

*Chief Draughtsman and Asst. Loco. Supt.*

MONTREAL, March 10th, 1876.

# ANNUAL REPORT

OF THE

SUPERINTENDENT

OF THE

## MONTREAL WATER WORKS

FOR THE

*YEAR ENDING 31st DECEMBER, 1876.*

Printed by Order of the Water Committee.



*Montreal :*

LOUIS PERRAULT & CO., CITY PRINTERS,  
87, St. James Street.

1877



DUPLICATE EXCHANGE 2 AUG. 1904  
Civil Engineering







ANNUAL REPORT  
OF THE  
SUPERINTENDENT  
OF THE  
MONTREAL WATER WORKS

*With the Compliments of*  
*Louis Lesage,*  
*Supt. of Water Works.*



Montreal :

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1877

*act*

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*YEAR ENDING 31<sup>ST</sup> DECEMBER, 1876.*

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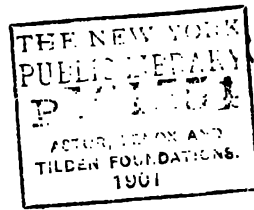
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1877

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ANNUAL REPORT  
OF THE  
SUPERINTENDENT OF THE MONTREAL  
WATER WORKS,

FOR THE YEAR ENDING 31<sup>ST</sup> DECEMBER, 1876.

*To the Mayor and Citizens of the City of Montreal,*

GENTLEMEN,—The following is my report of the operation of the Montreal Water Works Department for the year 1876, which I respectfully submit.

NEW WORKS--INLAND CUT.

The contract for this work which had been transferred to Messrs. F. B. McNamee & Co., at the commencement of the season, has been carried on with vigor and energy. The difficulties encountered by the ex contractor, Mr. Donnelly, have been successfully overcome and the work is in a fair way to an early completion by next summer. The report of Mr. McConnell, the resident engineer, appended to this report, gives a full account of the progress of the work under contract. According to this report about 17 per cent of the whole excavation remains yet to be done. The dry walls of the slopes, the masonry of the bridges and culvert are all completed, and the culvert itself finished and in operation. The regulating gates and the iron girders for the entrance bridge are also in place. The crib work of the still water basin has progressed rapidly and will be soon finished. The dredging of the basin is also done, and the floating gates built by M<sup>r</sup> Cantin are in that basin ready for service wh

The work has been so far advanced as to permit the Department to make use of the Cut during this winter, and has, although in an imperfect condition, proved of good service to the city, by affording a new channel to the old Aqueduct whose mouth has been almost completely choked with anchor ice during this winter; while at the New Cut no appearance of this anchor ice has shewn itself; thereby clearly setting at rest the doubt about the effectiveness of a still water basin. This work, "the first section of the Inland Cut," although very good as far as it goes will not however be of such utility as to warrant the price of its cost, unless it is followed by the continuation of the two other sections to the wheel house. For this reason and for what follows, I deem it my duty to bring once more this subject under the notice of the citizens.—Had I had any suspicion that the work would not have proceeded any further, I should certainly have never advocated the present section of the Inland Cut, as I would consider what is done as money thrown away, unless the two other sections were completed. At present the old aqueduct is altogether inadequate to supply the city by means of water power only, as can be seen by schedules Nos. 1, 2 and 3 of the appendix, which show that with the exception of the month of May, steam pumping was resorted to, although the water in the Aqueduct was not unusually low. By comparing the cost of the working expenses of the two systems (water and steam) it is easily seen that a good deal of economy might be attained by pushing this work to completion. Every year, the demand for more water is increasing and unless this new canal is completed at once new steam pumping works will be required to supply the rapidly increasing demand of the city. Besides, the annexation of the surrounding municipalities, which must surely take place, if we can judge by what is going on in all large cities, and this probably very soon, will force the city to provide for a great deal larger water supply, such as would be obtained by continuing to the wheel house the proposed new work,

which is calculated to meet these emergencies, and could not be done in a better time than when labor is cheap and plentiful.

#### EXTENSION OF THE MCTAVISH STREET RESERVOIR.

This work has progressed steadily during the year without any abatement of energy and skill, on the part of the contractors, 50,000 cubic yards of solid rock have been extracted during the year, yielding 90,000 cubic yards of broken stones for the Road Department. There have also been built 500 cubic yards of masonry in the new division wall. At the end of the year the total amount of rock excavation performed was over 100,000 cubic yards, and above 30,000 more remained to be excavated. In order to allow the contractors to make a junction with the present reservoir it has been necessary to empty one of its compartments, that is the West one, keeping in use only the Eastern division thereby reducing its total capacity from 13 millions to  $6\frac{1}{2}$  millions (about  $\frac{1}{2}$  of a day's supply of water for the city). Therefore, during this period which will likely extend to the month of July next, when it is expected that the Western extension will be completed and connected with the old one, the city water supply will have to depend mainly upon the uninterrupted working of the pumping machinery. As the stones coming from the excavation did not prove suitable for the building of the walls, save in so small a quantity as to be insufficient, a new contract had to be entered into to get proper stones from elsewhere, and the contractor Mr. McKeown, who undertook this work is pushing it vigorously. The masons are now engaged in erecting steam derricks and will be ready by the first fine days of the spring to push on the masonry with rapidity.

The conjoint report of the assistant engineers, Messrs. Lesage and Briand, hereto annexed give minute details of this work. Apart from the contract for the reservoir extension, the outside slope in front of the Western compartment has been lined with sods, the top surface of the road-way

graded and drained with 6 inch tile pipes and stone gutters, and the retaining wall at the foot of the slope has been plastered with durable cement so as to give its surface a solid cut stone appearance. A neat wire railing laid on the top edge of the slope protects the grass from being trodden on by visitors. This finish gives a neat appearance to this part of the work, and will be extended to the Eastern portion during the course of next summer. Since this Reservoir extension has been contracted for, new incidents have taken place, which will tend to increase considerably the cost of this work to the Water Department. In the contract it was stipulated that all the stones coming out from the excavation and unfit for the building of Reservoir walls were to have been broken into Macadam and deposited in different parts of the city, at the direction of the City Surveyor, the measurement, cartage and breaking of which was to have been paid by the Road Department. But, in the course of last fall, the Water Department was notified by the Auditor, that the Road Department's appropriation (the Paving Loan) for that purpose was exhausted, and that consequently the whole amount of future estimate would be charged against this Department, unless the Roads obtained a supplementary appropriation. This was not granted, and consequently the extra cost of breaking and carting has fallen upon the W. W. Loan, swelling the expenditure on Extension of Reservoir to much more than it would otherwise have been. It may be said in answer to this that it was my duty to stop the cost of breaking and extra cartage on being so notified, but, calculating on the Road Department carrying on its part of the arrangement, the contract was made at a price which included the breaking and carting, and I could not make any change without assuming the responsibility of invalidating the original contract.

#### NEW BOILERS.

In consequence of the increase of the water supply, it was thought necessary to add new Boilers to the steam



power at the engine house. This opinion was also endorsed by two competent engineers, Messrs. Blackwell and Barnett, appointed by the Water Committee to report on the state and efficiency of the pumping works. On this 3 Cornish boilers 26 feet long by  $7\frac{1}{2}$  diameter with 2 flues each fitted with Galloway tubes, the whole built with the best Buckley boiler plates, were contracted for by Messrs. W. P. Bartley & Co., and were to have been completed by the 1st of November last, but on account of a good deal of time having been lost by the giving up of the contract and of some changes afterwards brought into the construction of these boilers, the work was begun only at the end of June last, and could not therefore be completed in time. This is now completed with the exception of the connection with the steam pipes of the present battery of boilers, which connections, on account of the inconvenience of stopping the working of the engines, have had to be delayed till a proper opportunity presented itself. The work so far has been well done and with the best material, according to specification, and pronounced by the Government Inspector of steamboats who tested it, as a creditable job.

#### PIPES LAYING.

The total length of main pipes laid in the city during the year 1876 amounts to 18,590 lineal feet, viz: 1,738 ft. 30" cast iron pipes, 2,713 ft. of 12", 6,873 ft. of 10", 1,673 ft. of 6", 5,455 ft. of 4", and 138 ft. of  $\frac{3}{4}$ " lead pipe; 1 stop cock of 30", 6 of 12", 8 of 10", 7 of 6", and 18 of 4"—also 30 fire hydrants and 2,500 service pipes.

The total length of Cast Iron Pipes laid in the City up to date is 22,738 ft. of 30", 27,666 ft. of 24", 2,650 ft. of 16" 23,476 ft. of 12", 64,398 ft. of 10", 7,968 ft. of 8", 192,654 ft. of 6", 320,549 ft. of 4", 2,382 ft. of 3" and 8,090 ft. of smaller mains, making a total length of 672,571 lineal feet of main pipes, or 127.38 miles.

There are now laid 9 stop cocks of 30", 25 of 24", 3 of 16", 39 of 12", 64 of 10", 9 of 8" 238 of 6", 505 of 4" and 32 of 2½" making a total of 924 stop cocks.

There are 810 fire hydrants including 37 private ones.

The total number of houses supplied with water is 24,073.

The line of the new 30" Main on Sherbrooke Street, was continued eastward through Logan's Farm during the course of last winter and the portions which had been left undone over the newly filled gulleys at Montcalm Street and near Papineau Road, were completed during last summer after it had been ascertained that the new earth filling had ceased to subside. The intention is to carry this Main through the proposed extension of Sherbrooke Street Eastward as far as the city limits, so as to afford a connection with all the water Mains of the streets running downwards into the city, thereby bringing a relief to those Mains which are now too small. But as the extension of Sherbrooke Street has not yet been carried out further in that direction, the laying of that Main is delayed to a future day. The result attained by that portion of the 30 inch Main now in use has been to increase the pressure of water on the City mains by several pounds as it shown in schedule No. 12 and this result will no doubt be still more satisfactory when the whole is completed. The 12 inch Main on Pine Avenue from Mount Royal Park Westward to Côte des Neiges road has been completed. The extension of the 12 inch Main Eastward on Pine Avenue from University Street had to be interrupted at that street, as the Avenue has not yet been opened through the Esdaile and the Frothingham properties, but has been laid further Eastward in front of the Hotel-Dieu Hospital and in St. Urbain Street upwards from the last point to the city limits, and now awaits the opening of Pine Avenue from University to the Hotel-Dieu Hospital to make a connection. This Main is intended to supply the houses bordering the Mount Royal Park and later probably the St. Jean Baptiste

Village, whose localities are too high to be supplied from the lower service.

The portion of the high service which was left incomplete has been finished during last summer, and all houses West of University Street above the reach of the low service are now supplied by the high level reservoir.

On the low level service a 10 inch Main has been laid on Bonaventure Street from Victoria Square to Mountain Street, to relieve a 4 inch Main which had already proved inefficient to afford proper protection in case of fire.

Another 10 inch Main was also laid on St. Mary Street from Colborne Avenue Eastward to the city limits.

The enlargement of the Lachine Canal having necessitated the displacement of the 12 inch water Mains passing under this canal at the Wellington Street bridge for the supply of Point St. Charles, advantage was taken of the drawing of the water during the winter to lay, with the sanction of the government, a double line of 10 inch pipe across the canal, opposite Condé Street at a sufficient level below its bottom, so as to suit any future deepening. This Main on the South side of the canal was laid as far as St. Patrick Street with which it is connected, and on the north in a straight line to Basin Street and then from Basin Westward to Richmond Street on William Street to which it is connected. This will form a second crossing for the supply of Point St. Charles while the Main at the Wellington Street bridge will be relaid to a more suitable place.

The different contracts for the supply of cast iron and lead pipes, &c., have all been properly carried out.

The Schedule No. 10 shows all the pipes which have been laid during the year, their lengths, and the names of the streets in which they have been laid.

#### MAINTENANCE AND ADMINISTRATION.—AQUEDUCT.

The work on the old Aqueduct during the year has been, repairs to fences, cleaning of ditches, renewing the bridge at Rock Gates, the whole amounting to the sum of \$1660.63.

### PUMPING WORKS.—BUILDINGS.

The roof of all the buildings have had a coat of paint, and a portion of the roof over the workshop has been altered. The roof of the boiler-house had to be altered, and new trusses put on, so as to make this roof self supporting, in order to make room for the new boilers. The men's dwellings have also received the necessary repairs.

The machine shop has proved of a great benefit to the Department which since its erection has been enabled to do all the repairs to the pumping machinery and to furnish all the new hydrants, stop valves and the brass work used in the city distribution, besides a large amount of repairs to old hydrants and stop valves, which items used to entail large bills of expenses when they were done in the city machine shops.

The principal work done has been :

25 new fire hydrants and 7 repaired.

56 new stop valves and 12 repaired.

3½ dozen of steel drills.

9 footpaths augers.

3,000 brass stop cocks.

850 brass nozzles and 3 way branches.

409 brass couplings.

27 brass spindles for valve repairs, and a great many other articles and tools too numerous to enter in this list, besides a large number of wooden patterns for castings.

### MACHINERY.

The pumping machinery as can be seen by the report of Mr. T. Walsh, the Engineer in charge, here annexed, has had all the needful repairs done to it and is now in pretty good order.

Schedules Nos. 1 and 2 in the appendix shew that the quantity of water pumped during the year by the Water Wheels has been according to schedules Nos. 1 and 2.

Turbine Wheels..... 1,970,277,880 gall.  
 Breast Wheel..... 602,252,552 "

Making a total of..... 2,572,530,432 "

The expenditure at the Wheel House for repairs and administration, as per detailed statement of schedule No. 13, is \$5,992.19 making the cost per million of gallons raised 165 feet high nearly \$2.33, or one million of gallons raised 1 foot high \$.014.

The quantity of water pumped by the steam engines during the year, as per schedule No. 3 is as follows:

Engine No. 1.....	1,779,234
" " 2 .....	7,405,262
" " 3.....	1,002,440,456

Making a total of..... 1,011,624,952

The expenditure under this head has been as per detailed statement of schedule No. 13—\$24,190.54 or one million of gallons raised 165 feet high at about \$23.86—or a little over \$0.144 cents per million of gallons raised 1 foot high.

		Water.	Steam.
Cost of raising 1 million } 1875		0.02	0.119
of gallons 1 foot high. } 1876		0.014	0.144

Making 30 per cent less for water power and nearly 20 per cent more for steam.

#### TAIL RACE.

The flooring of the bridge over the Tail Race at the Lower Lachine Road having been discovered to be in a dangerous state, new flooring was put in. The St. Pierre Land Manufacturing Company having secured from the Corporation the right of way over the Tail Race has built a nice iron bridge according to the conditions imposed by the City. The state of the Tail Race itself is pretty the same as it was last year. During last summer portion of the land at the mouth of the Tail Race, bank of the river was rented to Messrs. Charlet Pilon, for the purpose of keeping s' re,

these parties were not obliged to pay any money until the end of the season, they left without paying anything. Instructions were given to the City Attorney to collect the amount which is \$25. I think if this land is to be rented again it would be more prudent to get the money in advance.

Expenditure on this item.....\$864.39.

### PIPE TRACK.

The line of the pumping Mains or pipe Track now Atwater Avenue is in the same condition as it was in 1875. The valves on the Mains are all in good order. The wooden culvert through which pass the two 24 inch pumping Mains under the Lachine Canal will have to be removed in order to deepen the bottom of the Canal, but, as to these pipes themselves, it is hoped that it will not be needed to disturb them, they being found sufficiently low.\* The brick work of the Atwater Avenue Tunnel was found to have been badly injured by frost and the work of a thorough repair was ordered to be made, but had to be discontinued for want of a sufficient appropriation after that the worst part of the brick work had been renewed. Gates have been put at each end of it to exclude the frost. Amount expended on this head from regular appropriation \$403 57 from special appropriation \$1,611.29.

### RESERVOIRS.

The McTavish Street Reservoir has been kept in efficient operation up to last December, when one of the compartments, that is the West one had to be emptied, to permit the contractor to excavate the portion of the rock between it and the extension. Previous to its being put out of use the centre wall was made secure from leakage by having the leaky joints pointed anew with Portland cement, and all other ordinary repairs have been done. Nothing

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\* Since writing the above it has been ascertained that these pipes have to be lowered to suit the enlargement of the Canal.

was done to the Old Coteau Baron Reservoir, which has been kept shut all the year. The expenditure has been \$305.74.

#### HIGH LEVEL SERVICE.

The pumping engine at the reservoir on McTavish Street has been kept working almost every day and has maintained the supply of the upper service without intermission; the engines and pumps are in good order and have not needed any repairs during the year. The boiler is also giving good satisfaction with very few repairs.

Schedule No. 4 shows this engine has pumped 60,713, 664 gallons of water with an expenditure of \$3,171.19 making the cost per million of gallons raised 218 ft. high at \$52.23 or nearly 24 cents for each million of gallons raised 1 foot high. The high Level Reservoir is in good order and has not required any repairs.

#### REPAIRS TO DISTRIBUTION & SERVICE PIPES.

The subjoined report of Mr. Lynch, foreman of the Water Works, gives a full account of the working of this branch of the Department which I endorse.

LOUIS LESAGE Esq.

*Supt. Montreal Water Works,*

DEAR SIR,

In conformity to your wishes I submit a synopsis of the work under my charge for the year ending Dec. 31st 1876, divided under the following heads, viz:

#### REPAIRS TO MAINS, HYDRANTS, VALVES, SERVICES, STREETS AND FOOTPATHS.

The repairs to mains are about the same as usual and the principal cause is the old complaint of breakage at drains, a great deal owing to the neglect of those making drains in not first making enquiry where the main pipes are in order to keep away from them as much as possible, and also in neglecting to have the ground properly covered in under the pipe, and so preventing it from si

We have had five serious breaks on the Mains this year, viz: One on the 30" Main, corner Sherbrooke and St. Lawrence Streets, and one on the 10" St. Denis Street near Sherbrooke St., both of which happened at the same time on the 11th of last May ; two on St. James St. on the 10" which also happened at the same time on the 27th of November. Another occurred on October 17th at the waste weir of the canal on Mill St. necessitating the relaying of a new Main across the weir. I am glad to say that considering the magnitude of these leaks very little damage was done owing to the men being on hand in time to shut off the valves. The total number of leaks and breaks have been :—35 leaks and 28 breaks, as per schedule No. 8.

The repairs to hydrants have been about as usual. The causes are owing principally to hydrants being so frequently frozen that in thawing them the leather valve, gets burnt and causes a leakage, necessitating a new valve. There have been 350 hydrants frozen during the winter of 1875-76 as per annexed statement.

I find the principal cause of the hydrants freezing is owing to the cold air from the drains, and I would suggest as a remedy that all new drains leading from the hydrants to the main drains be trapped, and that some of those already in, be so dealt with as an experiment. The staff examining the hydrants during the summer has been augmented from 3 to 5 men, and in winter from 7 to 13 men, thereby enabling each man to see his beat once a day in summer, and twice a day in winter, which is of the greatest advantage to the city. The repairs to valves has not been so large this year as usual, owing to so many new spindles having been already put in in several places. It has been found necessary also to put in new valves in place of the old ones which were so corroded that they were rendered useless. I would suggest that a 10" valve be placed on St. James Street 10" main, near the corner of Place d'Armes, as the shutting in that street is too long. I have much pleasure in certifying to the manner in which the new valves are made at the Wheel House work shop. They



are better than those I have seen from any shop in the city. In fact in mentioning this, I can with truthfulness include all the work we receive from this work shop as being of the best material and workmanship.

The leaks on services have been very numerous, but for a city like Montreal, where we have to contend against so many things, it is no more than can be expected, I find very few of them which might be attributable to bad work on our part, but a great many to the same cause as the leakage on Mains, viz: to the sinking of the ground over the drains. There have been very few leaks on couplings this year, owing to their being properly made, which enabled us to dispense with the iron cramps, that used to cut the lead pipes, thereby effecting a considerable saving both in iron and time.

We have had 454 frozen services during the winter of 1875-76, as per annexed statement. Our greatest trouble this year as well as in other years was the footpath business. For want of a better understanding between the Water and the Road Departments, a great source of expense and annoyance is the consequence. I find from examination that we have put in over 2,500 service pipe plates in footpaths, this last year, and I might say almost half of them were to replace those already put in. In very few cases, the plates which are taken off by the men of the Road Department when repairing footpaths are discovered, for they are pitched in the street, free to any one to pick up and I think the junk shops get the best share of them. I would suggest again that the footpath men employed by the Road Department should be obliged to put on the plates they may take off or else notify our Department when and where they go to repair or renew a footpath, so that we may be able to put men right after them to relay the plates. The first course would be the cheapest as it would dispense with the extra men.

Before concluding my report I would again draw your attention to the suggestion I made last year in regard to having men stationed at the East and West end of the

City, to stop water in cases of broken pipes, especially at night as it is too much for one man to perform the work as at present. The work shops and yard are quite inadequate for our purposes, being too much crowded and the buildings are in a very delapidated state, and unfit for our work. In closing this report, I have much pleasure in testifying to the general good conduct of the men under my charge, also in thanking you for the many valuable suggestions I have received from yourself.

Believe me, to be,

Dear Sir,

Your humble servant,

GEORGE J. LYNCH,

*Foreman Montreal W. W.*

The expenditure of \$15,169.45 on this part of the work although still heavy has however been less than that of the previous year which was \$26,618.00, and I have no doubt that if the reforms recommended in the above report such as in repairs to footpaths, and greater attention paid to laying drains, a further reduction of the expenses may yet be effected. The work shop has not been improved from what it was last year only that the expenses under this head have also been less than those of the previous twelve months.

In 1875 the expenditure was. \$11,088.37.

In 1876                   "                   . 8,862.53.

The buildings which are very delapidated require to be soon reconstructed.

#### CONSUMPTION OF WATER.

Schedule No. 3 in the Appendix shows the average daily consumption of water for each month since 1867. The daily average for the year 1876 has been 9,766,261, that is 981.044 gallons over the daily average of the previous year. In this is included about 800,000 gallons for fires, 40½ millions for watering the streets, and 222.500 for flushing sewers.

This extraordinary increase has alarmed the Water Committee, and a strict inspection of water pipes in houses has been established. This had the effect of bringing down the consumption nearly one million of gallons per day.

The consumption which from July last had been daily from 11 to 10 millions was reduced in December, when the inspection begun, to 8½, as seen by the schedule, this proving conclusively the benefit of house to house inspection.

This mode although unpleasant and annoying to a great many citizens; must be resorted to until the general introduction of water meters shall have produced a check upon the recklessness of some of the consumers. A great deal also of this waste is attributable to the kind of ball cock cisterns, now in general use, which in my mind ought to be entirely prohibited and replaced by more reliable fixtures. I am happy to state that several mechanics are now at work and hope soon to bring out considerable changes in this direction.

#### WATER METERS.

This branch of the Department has been maintained during the year in as good state of efficiency as could be expected considering the numerous difficulties attending the constant watching of the working of the water meters which are not yet reliable enough to allow their introduction in all houses generally. So far these instruments are only used in large establishments and have proved of great value in establishing a proper mode of fixing the water rates in manufactories, hotels, railroad companies, yards, &c. The total number now in operation is 407 of which 339 belong to the city, and 68 to private parties.

Schedule No. 9 shows their number, kind and size.

*Suggestions, improvements and repairs recommended to be carried out during the present year.*

On the line of the Aqueduct, some of the side ditches will require cleaning, the fences want partial repairs, as

do also the floorings of some of the Farm bridges. At the Wheel House, besides the usual repairs to the buildings and grounds outside, two valve chests and valve seats for Turbine Wheel No. 1 are recommended as duplicates in case of accident, as also a spare bevel wheel to Turbine No. 2. The Worthington Engine requires an apparatus to be attached to the air vessel of the pumps to replenish that vessel with air. The boiler house in that portion where are erected the three last new boilers, requires a new ceiling.

The mouth of the Tail Race at its discharge into the River St. Lawrence requires some alteration in order to prevent the washing of the banks which are already considerably damaged. The repairs on the Atwater Avenue Tunnel, at Dorchester Street, which were stopped during this winter, will require to be completed. The importance of controlling the water supply to each tenement in case of non-payment of the water rates, induced the Water Department to lay a separate service pipe to each of them. This work which had been prosecuted at a heavy cost during part of the two last summers, was stopped last Fall, in view of certain proposed alterations in the manner of levying the water tax, which was to make the proprietor responsible for the water rates of his tenants. This proposal, no doubt the best and safest mode of collecting the revenue from that source, is so unpopular that it may be a good while before it is carried out, and in the meantime, if the separate service pipe system was carried out, I think the surplus revenue derived by this more perfect control over the supply of water, would more than compensate for the expenses of the outlay. For this reason, I would recommend that the work be continued and brought to completion. For several years past, the work of the Department has increased to such an extent, that my position as the head of the Department has become too onerous for one man to be able to fill it properly. Therefore, during these few years past, I have had to devolve part of my responsibility upon some of my

employees, and in some instances this mode of working has been open to criticism. At the present moment, I may say that there is nobody in the Department and even outside of it, able to take hold of my position, without considerable previous study of the numerous duties to be filled and as I am not more privileged than any other mortal, subject to the accidents of life, I think the City's interest would be well served, in giving me an Assistant, who could give me the necessary help, and fit himself to take my place, should the occasion require. The want of proper office room at the City Hall has a good deal contributed and is still contributing to bring confusion in the management, and I would therefore recommend that some means be taken to provide the necessary accommodation.

I have the honor to be,

Gentlemen,

Your most hum. and obdt. servant,

LOUIS LESAGE,

*Supt of Water Works.*

MONTREAL, City Hall, 3rd March 1877.

"INLAND CUT," LOWER LACHINE,

*Engineer's Office,*

FEBRUARY 1st, 1877.

LOUIS LESAGE, ESQ.,

*Superintendent and Chief Engineer,  
Water Works, Montreal.*

DEAR SIR,—

The following statement shows the progress and present condition of the works for the New Aqueduct.

The contract for the completion of the 1st section was awarded to F. B. McNamee & Co., in March last, and about the middle of April the new contractors commenced putting up buildings for workshops and offices,—Mr. Donelly, the former contractor, at the same time demolishing his buildings and hauling the materials, as well as his plant of various kinds off the ground, all except one building, however, which still remains on the Corporation property.

The Cut was at this time flooded to about the level of 38.00 from springs and from surface water which had run in over the slopes, and also from a large "cours d'eau," of which the proper channel is through the culvert near the "Junction," but which had been dammed back in the Fall of 1875, and as it had injured and was threatening further injury to the banks of the old Aqueduct, I, by your order, had the dam opened, thus allowing the water to flow into the new Cut.

The lake ice came down on the 16th April when the water in the river opposite the new entrance was at 40.50 above datum. One of the cribs forming the outer end of the cross-pier had four or five courses of its up stream end torn away. No further damage was done to the works.

On the 29th April, water in the Basin was at 41.10. At this time the dam between the Basin and Inland Cut began to leak, but was repaired, strengthened and raised, so that from the 16th to 19th May, when the river was at its freshet height (and the freshet of last year was exceptionally high, the river opposite Entrance reaching 44.00 above datum) there was no leak of any importance nor has there been any trouble in this respect since. The public road has been along the top of this dam, during the progress of the works the past season.

*Excavation.*

On the 27th May, Excavation was commenced and had been continued at the Aqueduct proper up to the end of November. The quantity of earth taken out this season is approximately 120,000 cubic yards, making altogether about 83 per cent. of the total quantity to be removed according to your original estimate.

Besides the above, which includes all earth excavation from the prism of the Aqueduct, and from foundations for structures, as well as ditching, there has been removed by dredging 20,000 cubic yards, and for foundations of crib work, adjoining wing walls of Entrance Bridge, about 2,000 cubic yards. (It was thought advisable to do this latter work "dry," from the bridge side of the dam, rather than to come at it from the Basin side, with a dredging machine which would have involved a risk of disturbing the foundations of the wing wall.) This work being difficult of execution from the cramped position it occupies, and requiring more pumping than would otherwise have been necessary, the contractors asked and were promised an extra price per yard, which, however, will not be a serious item, as the aggregate quantity is small.

A ditch about 400 feet in length has been cut from the swamp north of the Aqueduct, square across to the culvert, intercepting and diverting the main "cours d'eau" formerly mentioned. Nothing has been done to the ditching at the back of the spoil banks.

The gutters at the back of the Roadway along the bank of the Aqueduct have been made, wherever the road is in cutting. They have not yet been made where the road is in filling, but the fill itself, which is complete in most places, will prevent the surface water wasting the slopes to the extent it did formerly.

Besides the foregoing items, there were about 1,000 yards excavated in the cuts made through the dams at "Junction" and at Entrance which were completed on January 13th, 1877, allowing the water from the St. Lawrence to flow to the wheels from a head two feet greater than that afforded at the Entrance to the old Aqueduct, which just then, and for some time previously, had been suffering from what Mr. Keefer has called "a dangerous glacial diptheria." The relief afforded by this timely increase of supply will certainly save the City a round sum of money, and has averted a state of things which might have resulted in something much more serious than a mere pecuniary loss.

*Dredging.*

As previously mentioned, there have been some 20,000 yards removed by dredging. Of this 5000 yards are from the Still Water Basin, near the shore side, between the upper end and the Entrance Bridge. The remaining 15,000 cubic yards have been taken from the shoal which extended from the upper end of the outer pier towards Fraser's Point, crossing diagonally the mouth of the Basin, and on which the depth of water varied from  $8\frac{1}{2}$  to 12 feet at Summer level. This has been deepened to 15 feet for a distance of about 500 feet up stream, thus leaving the entrance to the Basin unobstructed.

*Boulders measured as Rock.*

The quantity of boulders, of the size specified to be paid for as solid rock, got from the excavation has been less even than in former seasons, being a very small percentage of that required for lining the slopes of the Aqueduct, not to mention crib filling, so that the Contractors have had men and horses employed almost constantly hauling from adjoining fields stones to the works.

*Culvert under Aqueduct.*

The culvert under the new Aqueduct, near Station 43, is an inverted syphon formed by two lines of 30 inches cast iron pipes connecting two wells of masonry laid on timber foundations. The laying of the timbers for well foundations was commenced on July 18th, and the masonry was completed on August 5th. The pipes were furnished by the Corporation, but all other material and all workmanship by the Contractors. The laying of the pipes commenced on July 25th and was completed August 11th. The whole work thus occupied 21 working days. In laying the pipes there was some trouble from water near the centre of the Aqueduct which is the lowest point of the invert. Hand pumps were used and the difficulty was overcome without serious expense or delay. When the masonry was completed, the spaces between the walls and the faces of the excavated pits were filled with clay laid on in layers, wetted and well rammed. The spaces between and under the pipes were similarly filled up. Opposite the culvert, on both sides of the Aqueduct and at 60 feet from its centre line, crib work was built to fill the gap in the side slopes left by the excavation for culvert. The crib work was carried up to the level of 35.00 and on it the dry wall of the second slope was supported across said gap.



*Farm Culvert.*

The culvert under the embankment, which crosses the Dumberry Farm, North of the Regulating Gates, was commenced early in June and completed before the end of the same month. The contract provided for a culvert formed by two walls of stone (laid dry) and covered with round cedar, but the nature of the material on which it was to be built had not been ascertained, and on examination it was found that there was a depth of about four feet of muck to go through; the original plan was therefore abandoned, and instead, it was decided to drive piles and place round cedar behind them to form the sides and a covering of the same material; the opposite piles of the two sides to have cap pieces notched and pinned on to keep them apart at the top when the pressure of the embankment came on them. This was accordingly done, but unfortunately the embankment was not carried up on both sides simultaneously, and the side next the Cut getting most weight the culvert gave way in the opposite direction and some of the cap pieces became displaced. In order to remedy this, it will be necessary to remove a portion of the embankment, when there will be no difficulty in righting the part of the culvert which is displaced, and by carefully replacing the earth so as to maintain equal pressure on both sides further trouble may be avoided. The Contractors' attention being occupied with more important matters, they decided to leave this and the completion of the embankment to next season.

*Entrance Bridge.*

The laying of foundation timbers for Entrance Bridge was commenced August 4th. The corner stone was laid by His Worship Mayor Hingston, on August 12th, and the masonry of the bridge was completed on 25th November. The spaces between the backs of the abutments and the solid undisturbed earth are filled with clay puddle; there is also at the river end of each abutment a puddle wall extending from the back of the masonry several feet into the solid earth, and from the level of 23.00 to 44.00. The front and back of the platform on which the masonry rests are also protected by an apron wall of sheet piling and puddle. The spaces between the foundation timbers are likewise filled with puddle, except at a certain part where springs were numerous. Here concrete was used between and under the timbers. The slopes of the road approaching the bridge are held up on either side, by a wall of dry rubble.

The girders for this bridge (furnished by Mr. Macdougall) are in position, but the braces are not yet put in. Messrs. McNamee & Co. have made a temporary roadway on these girders for the use of the public during the present winter.

The floating Stop Gates for the new Entrance were delivered last Fall by the Contractor, Mr. Cantin, at the Still Water Basin, where they now are.

#### *Regulating Gates Bridge.*

The laying of foundation timbers for this Bridge was commenced August 30th, masonry was commenced on 7th September and finished 7th November. As the earth at the back of the south abutment was found to be unreliable, a wall of rubble in cement was built from the back of abutment for a sufficient distance to reach firm earth. It was carried up in steps regulated by the quality of the material arrived at, until at the top (level of 42.00) it extended some 23 feet back. On each side of this wall the loose earth removed was replaced by puddle. In the crib work supporting the dry wall at this bridge, the compartments next the masonry are also filled with puddle. At the north abutment the bank being of hard pan, the masonry was connected to it (at the front or up stream side) by a wall of concrete four feet thick, the remaining space filled with puddle; also an apron of sheet piling and puddle on each side of the timber foundations to protect them from wash.

The Gates and Iron work connected with them had been delivered on the works by Mr. Chanteloup in '75 and the early part of '76. On Nov. 6th his men commenced fitting them, and completed their work with the exception of keying on the quadrants on Dec. 8th. The Crab winches for the stop logs are also delivered but could not be put in position, as the superstructure of the bridge is not yet built. Messrs. McNamee & Co., by order of the Water Committee, kept the cut dry to enable Mr. Chanteloup to prosecute his work.

#### *Masonry.*

The masonry has been, during its entire progress, subject to a rigid inspection by an experienced man, and may be relied on as substantial. It will be necessary however to examine all the pointing next spring and probably to have many parts re-pointed, as there was some done after frost had set in. The Cement used was from three different places, viz: Quebec, Hull and Oswego; their quality was

found to be in the order in which they are named. The Mortar was formed of 2 of river sand to 1 of cement. When other than river sand was used the proportion of cement was increased. The concrete was of 2 stone, 1 sand and 1 cement.

### *Slope Walls.*

The dry wall lining the slopes of the Aqueduct is nearly completed ; there remain to be done only three or four small patches of from ten to twenty feet in length and one piece somewhat larger and of extra depth, near the " Junction ". These unfinished pieces are where the wall had been built, but was removed either to allow a roadway to be made or to make a dam across the cut, except the last mentioned piece which must remain unfinished until the junction is completed. Messrs. McNamee & Co. have built nearly 9,000 cubic yards of dry wall, this is in excess of the estimate, and is owing to the fact that in many places, sand or muck was found at the elevation at which the bottom of the wall was to have been, necessitating going lower to insure stability.

### *Crib work.*

Besides the crib work for protecting the banks of the Canal at the Entrance Bridge and Regulating Gates, and that opposite the Culvert, there have been built by the present Contractors, 10,000 cubic yards. The four lines of crib work forming the Still water Basin, require to complete them only two pieces of about 60 and 30 ft. in length. The site of these is now occupied by the dam at entrance, and they cannot be built until the dam is removed. The superstructure of the outer pier is progressing favourably and will be finished before the spring. There is still the damaged crib at the lower corner to repair, and the superstructure of that part to build ; this will not be done until next summer.

In sinking the cribs for the outer pier the line was not well preserved, consequently there are jogs at several points below the water surface. Whether this will be of any practical detriment to the work is very doubtful, especially as for a foot or so below the surface these jogs will be filled by pieces shaped to suit and bolted securely on. Above water the line shows true. As to quality of material used and excellence of workmanship in other particulars the crib work is all that could be desired.

*Fencing.*

7,500 feet of permanent fencing have been made along the boundary lines of the New Aqueduct property, this leaves about 2,500 feet still to do.

*Unwatering.*

Mr. Wright of the firm of McNamee & Co, has obligingly furnished me with particulars in reference to the pumping. As these are reliable, and (in view of the frequent discussion this question has undergone) interesting, I beg here to submit them for your perusal.

The first pump used on the works, under the new contract is a 15 inch submerged centrifugal, by White, Clark & Co., Baldwinville, N. Y., diam. of wheel 42 inches; driven by a locomotive engine, cylinders 16" x 22" stroke, worked at 66 horse power; pump wheel making about 250 revolutions per minute, lift 28 feet 6 inches. discharging about 8,000 U. S. gallons per minute.

This pump was placed at about 350 feet from the dam at Entrance, on the Northside of the Cut. It commenced work (a trial) on the 12th June, pumped three hours; water fell in Cut 1 inch per hour. The Cut at this time was flooded its entire length. On 13th June, pumping commenced at 7:40 a. m., and at 7:40 next morning (14th) nineteen hours pumping had been done and the water had fallen 17 inches. Pumping was continued all day 14th and 15th and up to 10 a.m. on the 16th. Heavy rain storm on the afternoon of the 14th during two hours of which the water gained on the pump half an inch. On the 15th, bottom of Cut began to show, and on the 16th at 10 a.m. the cut was dry, as far as drained by the pump, having been emptied in 69 working hours. During the remainder of the season, one hour in twenty-four was the working time of this pump.

When the excavation for foundations at Entrance Bridge got below the level of the 15 inch pump, it became necessary either to lower the pump or to raise the water to it. The latter course was decided on, and for that purpose a 2½ inch syphon was placed in Entrance Bridge pit and was worked by steam from the boiler of large pump. As the number of springs in the Bridge pit increased, the syphon became unable to do the work, it was therefore removed; having worked from the 10th to the 26th July.

The syphon was replaced by a 4 inch submerged centrifugal pump, by White, Clark & Co. This pump commenced work on July

26th, at which time the Bridge pit was flooded to a depth of about 4 feet. On August 1st, the pit was sufficiently dry to resume work in it, after which the pump worked six minutes out of every ten, for six weeks, the water after that gradually lessening until finally two minutes in ten sufficed to keep the pit dry. This pump was driven by an engine with two cylinders each five inches by twelve inches stroke. The pump is capable of discharging when making 450 revolutions per minute, 1,200 U. S. gallons per minute with a lift of 14 feet.

It stopped working for the season on 5th December.

At Station 43.00 near the Culvert, a six inch submerged centrifugal pump, (Heald, Lisco & Co., makers, Baldwinville, N. Y.,) was put up, and commenced work on Friday, 30th June, worked three hours and stopped for repairs, recommenced pumping at eight the same night and worked until the Cut was emptied, Monday July 3rd. During this time she worked 18 hours out of the 24 or 61 hours pumping in all to empty this end of the cut. (Lift 20 feet). Once emptied, one hour's work in the 24, sufficed to keep it dry. The same pump was subsequently moved to the Regulating Gates Bridge where she commenced pumping on 4th September and continued until Dec. 15th, working the same time as at former place, viz: 1 hour in 24. After a-heavy rain, a slight increase in working time was necessary. At the Regulating Gates a 10 by 12 engine was substituted for the one used at the Culvert. The lift here was 24' 2". Number of revolutions of pump wheel per minute 510 at which speed and height of lift this pump will discharge 2,505 gallons per minute.

Thus this hitherto troublesome problem of unwatering and keeping dry the "Inland Cut" has been met and solved.

The works have been pushed on with vigor during the past season. The fact that all the most difficult and most important parts (except the excavation) have been successfully completed during the first season under the new contract speaks well for the contractors.

The force employed by Messrs. McNamee & Co., from 1st May to 1st December gives a daily average of 262 men (of all grades) and 82 horses. There has been on the whole less drunkenness on the works than in former seasons, though the facilities for procuring liquor have been the same if not greater. The rate of pay for labourers was \$1 00 per day during the working season, paid fortnightly. In August the men struck for higher wages, which the contractors refused, and the men gradually returned to their work at the old rates, without having been in the least riotous or disorderly.

The only serious accidents I have to record, are two. The first occurred Sunday, 28th May, when a boy, son of one of the workmen was drowned in the Cut near the temporary bridge at Dumberry's Farm Crossing. No blame attached to any one in this matter. The other was from the upsetting of a dog cart in which Messrs. Nish and Wright were driving over the works. The former escaped unhurt but Mr. Wright received injuries to his left arm which have disabled it, up to the present, and it appears doubtful if he can ever recover the use of it.

The work remaining to be done in order to complete this, the first section of the New Aqueduct, may be briefly stated as follows :

At Entrance Bridge the cross braces on stays of guiders to be rivetted in their places, and the wooden superstructure of said bridge to be built.

Superstructure of Regulating Gates bridge ; placing of the stop logs and crabs for hoisting same. Placing quadrants, needles and levers for working wicket gates.

Slope walls about 200 lineal feet.

About 800 feet of embankment averaging say 3 ft. in length and 18 feet in width at top.

Excavation, 17 per cent of the original quantity.

Dredging (dam at Entrance) fifteen to seventeen thousand cubic yards.

Crib work about 3,000 cubic yards.

Fencing 2,500 lineal feet.

Finally the repairs to culvert under the embankment crossing Dumberry's swamp, and completion of that embankment.

The engineer's, office having been destroyed by fire in January '76, another one has been built on the same site. The new one is the same size as, and very similar in appearance to, the first. It was put up by Mr. Jas. Sheridan, contractor, and was commenced April 24th and completed towards the end of May '76.

Trusting the foregoing remarks convey all information of interest, regarding the past season's operations.

I have the honor to be,

Sir,

Your obdt. servant,

B. D. McCONNELL,

*Resdt. Engineer, "Inland Cut," M. W. W.*

MONTREAL WATER WORKS,  
*Engineer's Office.*

MONTREAL, Feb. 26th, 1877.

LOUIS LESAGE, ESQ.,

*Superintendent and Engineer in Chief  
of Montreal Water Works.*

DEAR SIR,

In accordance with your instructions we beg to submit the following statements in reference to the progress and present condition of the work for the extension of the McTavish Reservoir, and also of the tools and implements used to perform the work of excavating into the solid rock.

In the month of July 1874, previous to letting out the contract for the McTavish Reservoir, a general and accurate survey of the land laid out for its position was made and cross sections taken at every five feet and at right angles with the lines or sides of said extension, by taking the different levels from the right of said lines up to the railing of present Reservoir, and then from the left up to the boundary fence of the Corporation property; this was for the extension of the present Reservoir to the line of its railing.

Within the present Reservoir on the North-west side, there was a portion of rock that had been left untouched from the time of its building and that part in both basins forming the actual Reservoir was cross-sectioned in the month of August 1872.

Having made up the quantities of rock excavations according to the above surveys, the bulk of rock excavation to be made in the extension of the Reservoir, including roadways all round, back ditches, etc., was found to amount to..... 107,222 cubic yards, and in the present Reservoir, comprising both basins..... 21,137 " "

Besides the above, it must be stated here that on account of cracks, fissures and some blast holes misplaced along the North-west side of extension, it has been found necessary, in order to secure good sound solid rock, to put three feet backwards that North-west line from its former position.

This increased the amount of excavation to be done by about..... 1,048 cubic yards.

In order to secure a uniform water line around the three sides of extension down to the level 204, it has been found advisable to trim the rock so as to allow a masonry wall of four feet average thickness to be built up to the proper grades to receive the coping.

This has also necessitated an increase of excavation of about..... 1,100 cubic yards.

Making the total quantity of excavation to amount approximatively to 130,780 cubic yards.

Since the contract has been awarded to Messrs. Whelan & Co., a survey and measurement of the general work has been made twice a year, in the Spring and in the Fall on the old lines and in the same manner as above described, and the result was found that at the close of the year 1875—50,000 cubic yards of rock had been excavated, or say : 38 per cent. of the whole amount.

At the close of the year 1876, 100,000 cubic yards of solid rock had been taken out of the extension including also a portion taken out of the Western basin, which shows that 76 per cent. of the whole work has been accomplished in the extension and present Reservoir.

The contractors pushed on their contract as rapidly and intelligently as could be expected, considering the



position of the work, being situated in the midst of the City and surrounded with private and public buildings of every description, which causes contributed greatly to check its progress and thereby prevented their work from advancing as fast as they might have done otherwise if it had not been situated as it is.

Great caution in blasting had to be exercised so as to avoid damages or accidents (and it must be said here to the credit of the contractors, that no loss of life nor accident of any kind occurred on their works.)

As stated above the excavation in one of the basins of present Reservoir has been begun and about 60 per cent. of the rock to be removed has been taken out of it.

The Centre Division wall has been laid out last Fall, and about 12 per cent. of the masonry of said wall has been built and is awaiting for its completion, the clemency of the weather.

As much of the stone suitable for the masonry as could be found in the excavation has been laid on close proximity of the work; the contractors also are using every means in the shape of implements to secure solidity and rapidity of execution.

They have now on the ground several derricks and principally one to be worked by steam, ready to resume work, the latter running on rails which is expected to render great service and save a large amount of labor and time.

The Division and Retaining walls of the Western basin will be completed about the 1st of July of this year, and as all the excavation, with the exception of that portion dividing the basin now in use, will be finished in the course of a month, it can safely be said that by the 1st of July next the Western basin will be ready for public use.

The Retaining wall in front of the Valve house being in a dilapidated condition has been pulled down and rebuilt in a substantial manner.

The embankment from the Valve house Westward has been graded and sodded, which adds considerably to the good appearance of the Reservoir.

A 12" pipe has been connected in front of the Valve house on one of the raising mains to the Worthington Engine which supplies the High Level Reservoir.

This has been done so as to fill this Reservoir independently of that of McTavish, whose western compartment, in which is introduced the section pipes of the pumps, had to be emptied so as to allow the rock which separated it from the new work to be taken away.

The result of different experiments made at the McTavish Reservoir to obtain the ratio of a solid cubic yard of black limestone to a broken one as follows :

Rates of a solid cubic yard of black limestone to a broken one.....	1:1.90
Ratio of a solid cubic yard of banc rouge to a broken one.....	1:1.95
Average ratio of black limestone and banc rouge.....	=1:1.92

Weight of one cubic yard of broken stone produced at the McTavish Reservoir from steam crushers.

Black stone broken, ordinary size (average of 3 cubic yards weighed).....	2.435 lbs.
Black stone broken, fine (average of 3 cubic yards weighed).....	2.510 lbs.
Banc rouge broken, ordinary (average of 3 cubic yards weighed).....	2.340 lbs.

Two blocks, one of black limestone and the other of banc rouge, having been cut out of these two different stones and polished each to an exact cube of *one* cubic foot it has been found to result as follows :

A cubic foot of black limestone weighs.....	171 lbs.
“ “ banc rouge “ .....	169.02 “

## TOOLS AND IMPLEMENTS.

The contractors have brought into use the best modern appliances that are used in works of this description ; for instance :

They have on the works five steam drills of the Burleigh pattern ; four of them have been in constant use and the other in reserve in case of an accident.

These drills are each run by a separate boiler (of 10 H. P. capacity) so as not to carry steam too far as it condenses rapidly, especially in cold weather.

Besides the Engineer who is in charge of the boiler, two men are employed at the drill, one of them to feed and the other (being a skilled mechanic) in charge of the drill, to regulate, etc.

The bore made by these drills is  $3\frac{1}{2}$ " D at top of hole and  $2\frac{1}{2}$ " D at bottom, for an average depth of 25 feet.

The average work of the drills varies with the nature of the rock. When constantly at work in homogeneous black limestone, they could drill 50 feet in 10 hours, or 5 feet per hour ; but as there is always a loss of time in moving the drills and removing the drill points, connecting the pipes, etc., the average work does not exceed 25 feet per 10 hours, or 2 feet 6" per hour.

There is also on the work a small Burleigh stooping pattern drill, that is employed for trimming, sloping, etc. That drill, if steady at work, could average a boring work of 100 feet per day, or 10 feet per hour.

## MODE OF BLASTING.

Principally high explosives have been employed such as Dynamite, Mica powder, Dualine, and Rend-rock ; the two latter have been most extensively used. These powders have been exploded principally by electricity, none but best material have been used. The battery employed is one similar to that used by the United States Navy Department in their Torpedos, it being adopted by them for its superior quality and efficacy.

By the use of this battery, miss-fires and premature explosions, which are the principal causes of all accidents, are avoided.

The above mentioned battery is known as Farmer's Electro Dynamo.

The power of the explosives employed, (say in heavy cuttings, not bound at the sides and in good homogeneous rock,) would remove about 10,000 lbs. per pound of explosive used, or a pound of explosive (say Rend-rock or Dualine) would remove  $2\frac{1}{2}$  cubic yards in heavy cuttings.

In these explosions the bottom part of the rock blasted is better broken than the top, which, as it comes out in large masses, requires to be broken so as to facilitate handling.

#### CRUSHERS.

There are also on the works four stone crushers of the Blake pattern, driven by three engines of nominal 25 H. P. each.

Each crusher, when well fed or attended to, will crush 100 tons per day.

It takes seven horses to supply each mill with stone and four men to feed it.

To run the boilers, two firemen, one engineer and one oilman are employed.

The crushers are run at an average speed of 300 revolutions per minute, with a power of 80 tons per square inch.

The average weight of each crusher is 25,000 lbs.

The boilers are run at 80 lbs. steam pressure, and the daily consumption of fuel is about one ton (nett) of Lehigh coal.

The wear and tear of these crushers as they are obliged to do an enormous work is very great on account of the constant renewal of the chill plates.

The excavation is drained by a centrifugal steam pump known as Heald & Lisco's of Baldwinville, N. Y. State, being able to pump 2,000 Imp. gallons per minute. The boiler attached to it and which drives the engine is a nominal 20 H. P. one.

Hoping that the above detailed facts will answer your purposes,

We remain, dear Sir,

Your obedient servants,

SIMON LESAGE, C. E.

V. BRIAND, C. E.

To

LOUIS LESAGE, ESQ.,  
*Superintendent.*

SIR,

My report for the year ended is respectfully presented.

During the past year all the pumping machinery, &c., gave very general satisfaction, and with but few accidents. The most serious one occurred on the 8th of June; it consisted in the bursting of one Breast Wheel valve chest. Fortunately I had one in reserve at the time, which was put in and ready to work on the 30th of the same month. Since that time, and by order of the Committee, I had two more cast; these are on hand in the event of similar accidents.

The Brass Boxes of the lower end of the connecting rods of the pumps were renewed, at present all is in good order.

The leaky joints of the new valve chests of Turbine No. 1 were made right. During the month of November last, one of the two old valve chests belonging to this wheel sustained a fracture between the bonnets, it is being repaired with a good prospect of making it as strong as ever; the other is being stayed with a view of preventing a similar accident. Then this Turbine and all its connections will be in good order. I would recommend, however, that duplicates for the old chests be provided, also two valve seats, (there being no spare ones on hand at present.)

Turbine No. 2 required no repairs during the past year, and with the exception of a broken valve chest, which must be replaced by a new one, and overhauling the reflux valve, all is in excellent order. I would however remind you of the necessity of having a spare Bevel wheel ready to replace the present one in case of accident to the cogs, which may occur at any moment.

The Beam Engines are in good order, having required no other repairs than repacking from time to time during the past year.

The Worthington Engine continues to perform its work admirably. During the month of May last it was taken apart for examination and excepting that the low pressure cylinders showed signs of a slight escape of steam between the piston and rings, everything was perfectly correct. It became necessary to renew the Air Pump valves and a number of the spiral springs in the Water Pumps.

Very considerable delay and annoyance is experienced by being obliged to stop the engine in order to replenish the air in the Air Vessel. I would recommend that an apparatus be provided for the purpose.

*Boilers.*

During the past year, the Tubular Boilers and Furnaces underwent all necessary repairs. The defective sheet in one of the furnaces of the Lancashire Boilers was substantially secured by the addition of extra stiffening rings.

The Ashcroft Patent Doors and Bars with which those Boilers were provided, are a great saving in fuel and labor, and I believe fully up to representation of the Patentee.

The new Boilers contracted for by W. P. Bartley & Co., promise to be an excellent job. In order to make room for them it was necessary to remove the posts that supported the upper floor of the old Coal Shed, and to support this by trusses at considerable expense. A new ceiling is also necessary to make it complete.

As the first section of the Inland Cut is to be connected to the Aqueduct next spring, there will be a surplus water power which through want of the necessary number of Wheels cannot be utilised. At the same time and in order to keep up the supply, steam power must be employed, the attendant expenses of which would in a short time cover the cost of another Turbine. On this account you will see the necessity of bringing the subject under the notice of the Water Committee for their action thereon.

I remain,

Yours very respectfully,

THOMAS WALSH, M. E.

*Wheel House.*

## APPENDIX.

No. 1.—SCHEDULE shewing the Duty of the Turbine Wheels.

MONTHS.	Revolutions. Wheel No. 1.	Revolutions. Wheel No. 2	Total No of Revolutions.	Number of gallons pumped.	Olive Oil in gallons.	Coal Oil in gallons.	Tallow in pounds.	Coal for Fuel in pounds.
1876								
January .....	583,507	106,257	689,764	151,683,167	31,65	17,15	48,00	9,950
February .....	451,576	83,312	534,888	117,547,384	25,05	13,72	.....	8,680
March .....	208,876	124,723	333,599	67,127,112	11,94	12,47	.....	8,460
April .....	563,071	278,389	841,470	172,598,595	27,77	12,78	.....	10,120
May .....	503,093	501,007	1,004,100	191,369,705	29,44	13,41	6,00	3,360
June .....	601,545	563,266	1,164,811	223,476,755	29,16	11,22	.....	.....
July .....	539,686	536,813	1,076,499	205,195,162	53,61	12,78	14,00	.....
August .....	567,458	525,781	1,093,239	210,033,302	39,10	13,41	17,00	.....
September .....	502,474	479,067	981,541	187,978,358	39,44	15,90	.....	.....
October .....	435,985	427,394	863,379	178,818,817	26,38	18,40	12,00	6,045
November .....	465,463	431,900	897,363	172,578,739	28,61	18,71	12,08	11,000
December .....	169,894	355,983	525,877	92,270,786	9,16	13,72	.....	17,820
Total .....	5,652,448	4,413,902	10,066,350	1,970,277,880	329,31	173,67	109,08	75,435
Last Year .....	4,151,973	3,268,322	7,420,295	1,451,121,365	194,42	165,80	81,00	50,130

No. 2.—SCHEDULE shewing the Duty of Breast Wheel.

MONTHS.	Revolutions.	Number of Gallons pumped.	Olive Oil in Gallons.	Coal Oil in Gallons.	Tallow in Pounds.	Coal for Fuel in Pounds.
1876						
January .....	.....	.....	5,22	11,85	.....	15,250
February .....	.....	.....	3,88	10,91	.....	14,200
March .....	199,847	29,577,356	7,50	14,03	.....	13,240
April .....	333,824	49,405,952	16,38	10,93	.....	1,350
May .....	526,483	77,919,484	22,22	13,72	.....	.....
June .....	152,185	22,523,380	18,61	11,54	.....	.....
July .....	553,189	81,871,972	30,88	13,72	.....	.....
August .....	541,661	80,165,828	26,66	14,03	1,00	.....
September .....	515,613	76,310,724	27,22	16,22	.....	.....
October .....	455,605	67,429,540	17,22	19,02	12,00	240
November .....	483,878	71,613,944	18,05	19,02	12,00	840
December .....	306,989	45,434,372	18,05	18,09	.....	9,540
Total .....	4,069,274	602,252,552	211,89	173,08	25,00	54,660
Last Year .....	2,894,834	428,435,432	160,44	195,80	12,00	76,365



No. 3.—SCHEDULE shewing the Duty of Engines Nos. 1, 2 and 3.

MONTHS.	Engine No. 1.		Engine No. 2.		Engine No. 3.		Number of Gallons Pumped During the Month.	Engine No. 2.		Engine No. 3.		Number of Gallons Pumped During the Month.	Total No. of Gallons Pumped During the Month.	Coal consumed for Pumping, in Pounds.	Banking Fires, in lbs.	Olive Oil in Gallons.	Coal Oil in Gallons.	Number of Pounds of Coal to raise 1 million Gallons.	Average Pressure of Water on the Pump Pistons.		
	Running Time.	Revolutions.	Running Time.	Revolutions.	Running Time.	Revolutions.		Running Time.	Revolutions.	Running Time.	Revolutions.								No. 1	No. 2	No. 3
1876.	H. M.		H. M.		H. M.			H. M.		H. M.											
January	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
February	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
March	1.50	2,503	33.15	30,992	5.512	5,612,547	.....	695.45	374,896	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
April	.....	.....	.....	.....	.....	.....	.....	737.45	513,832	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
May	.....	.....	.....	.....	.....	.....	.....	298.30	148,019	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
June	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
July	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
August	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
September	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
October	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
November	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
December	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	12.75	10,003	1,779,294	41,633	7,405,292	.....	.....	4,371.40	2,378,110	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

No. 4.—SCHEDULE showing the duty of High Level Service Engine.

MONTH.	Engine.		Number of gallons pumped during the month.	Coals consumed for pumping in pounds.	Coals consumed for banking fires in pounds.	Olive Oil in gallons.	No. of pounds of coals to raise 1 million gallons.	Average pressure of water in the pump pistons.
	Running Time	Revolutions.						
1876	*H.M.							
January .....	148.30	243.243	2,918.916	29,674	11,830	4.91	14,223	50
February .....	208.45	338.202	4,058.424	41,882	11,894	10.20	13,251	50
March .....	210.00	341.670	4,100.040	38,932	11,696	6.95	12,318	50
April .....	208.40	367.674	4,412.328	40,652	9,924	7.67	11,463	50
May .....	257.35	452.272	5,427.264	45,512	9,350	6.15	10,109	50
June .....	293.40	545.194	6,512.376	55,869	10,853	7.81	10,199	50
July .....	324.15	571.403	6,856.836	55,521	12,091	10.48	10,007	50
August .....	423.30	723.308	8,679.696	74,536	10,514	14.05	9,799	50
September .....	298.55	485.609	5,827.308	52,485	16,136	9.21	10,746	50
October .....	251.10	378.170	4,534.040	41,429	9,495	7.83	11,219	50
November .....	198.15	291.270	3,495.210	33,768	7,437	5.61	11,789	50
December .....	220.05	321.423	3,857.196	39,847	8,879	6.19	12,630	50
Total .....	3043.20	5,050,472	60,713,664	551,107	124,099	97.06	11,121	

No. 5.—SCHEDULE shewing the Level of Water and Evaporation at the  
McTavish Street Reservoir for the year 1876.

MONTHS.	Average monthly depth.	Rain Gauges in inches.				Evaporation in inches.
		Rain.	Snow.	Reduced to rain.	Total Rain.	
1876.						
January.....	22.87	0.51	18.00	2.02	2.53	1.01
February.....	22.10	1.94	21.00	2.46	4.40	1.36
March.....	21.03	.....	56.00	4.82	4.82	1.20
April.....	21.79	1.25	6.50	0.79	2.04	1.22
May.....	22.61	2.78	.....	.....	2.78	3.11
June.....	22.13	2.81	.....	.....	2.81	4.88
July.....	21.57	4.65	.....	.....	4.65	5.63
August.....	20.79	1.85	.....	.....	1.85	6.03
September.....	22.03	5.25	.....	.....	5.25	2.94
October.....	18.56	2.30	.....	.....	2.30	2.21
November.....	21.51	1.39	.....	.....	1.39	2.17
Décember.....	18.05	.....	29.00	1.23	1.23	2.02
Total.....	.....	24.73	130.50	11.32	36.05	33.78
Last year.....	.....	19.47	85.50	7.98	27.45	30.10

No. 6.—Number of places where the Corporation Plumbers were called  
during the winter 1875-76, indicating the number of cases where  
the Corporation and the Water Tenants were at fault :

CORPORATION SIDE.		LANDLORDS AND TENANTS' SIDE.	
Choked.....	30	Service pipes at fault:	
Frozen outside.....	107	Frozen inside.....	38
Other causes.....	8	“ in the wall.....	309
Total.....	145	Burst by frost.....	1
		Other causes.....	30
		Total.....	378
			145
		Grand Total.....	523

There has been 350 fire hydrants found frozen 1805 times during  
the winter 1875-76.













Amherst, near Mignonne.....	June	7	6 in.	1	1	1	Recaulked the joint.	Joint badly made.
Jurors, near Chénneville.....		19	4 in.	1	1	1	"	"
Sherbrooke, near St. Lawrence.....	May	11	30 in.	1	1	1	Put in a new piece.	Piece blown out.
St. Denis, near Sherbrooke.....		11	10 in.	1	1	1	"	"
Common, near St. Peter.....	June	22	.....	1	1	1	"	"
Sherbrooke and St. Mark.....		22	.....	1	1	1	hydrant.	Old one worn out.
St. Constant, near Ontario.....		26	4 pcs.	1	1	1	valve.	Valve
Craig and Wolfe.....		26	.....	1	1	1	valve.	Broken pipe across drain.
Parthenais, near St. Catherine.....		26	4 in.	1	1	1	valve.	Valve worn out.
Montcalm and Craig.....		29	4 in.	1	1	1	piece.	Broken pipe.
St. Urbain, near Ontario.....		8	4 in.	1	1	1	spindle.	Screw of spindle worn out.
St. Sulpice, off de Brosolles.....	July	15	.....	1	1	1	piece.	Split pipe.
St. Louis and Berri Lane.....		17	.....	1	1	1	valve.	Valve worn out.
St. Mary and Suzan.....		18	.....	1	1	1	one.	Old one split by frost.
Perthuis and Lacroix.....		18	.....	1	1	1	valve.	Old one worn out.
Sherbrooke, past Guy.....		19	.....	1	1	1	"	"
Sherbrooke, off Simpson.....		20	.....	1	1	1	"	"
St. Mary and Frontenac.....		21	.....	1	1	1	"	"
Dufresne, near St. Catherine.....		21	.....	1	1	1	"	"
St. Catherine and Vistation.....		25	6 in.	1	1	1	"	Rod broken.
Panet and St. Catherine.....		25	4 in.	1	1	1	"	Old one worn out.
Durham and St. Catherine.....		25	4 in.	1	1	1	"	"
Wellington, S. S. Canal.....		29	12 in.	1	1	1	"	"
Côte des Neiges Hill, H. L. M.....		29	12 in.	1	1	1	Recaulked the joint.	Joint badly made.
St. André, above Ontario.....		29	.....	1	1	1	Put in a new piece.	Split pipe.
Centre.....	Aug.	4	.....	1	1	1	valve.	Valve worn out.
St. Mary and Suzan.....		4	.....	1	1	1	"	"
Sanguinet and Vitre.....		4	.....	1	1	1	rod.	Rod broken.
St. Joseph and Versailles.....		5	.....	1	1	1	valve.	Valve worn out.
Papineau Road, last Hydrant.....		5	.....	1	1	1	"	"
Durham and Logan.....		7	.....	1	1	1	"	"
Durham and Lagauchetière.....		7	.....	1	1	1	"	"
St. Catherine and Amherst.....		8	.....	1	1	1	"	"
St. Mary and Panet.....		11	.....	1	1	1	hydrant.	Old one split by frost.
				1	1	1	"	"

No. 8.—Schedule shewing the repairs done to Main Pipes, Hydrants and Valves, during the year 1876.

POSITION.	DATE. 1876	DIAMETER.	VALVES.	HYDRANTS.	LEAKS.	How Repaired.	Probable cause of injury.
DeSalaberry and St. Mary .....	Aug. 11	4 in.	1	1	1	Put on a new valve.	Old one broken.
Panet and St. Mary .....	11	3 in.	1	1	1	"	"
Sanguinet and Dorchester .....	14	.....	1	1	1	"	" worn out.
Seaton near Logan .....	14	.....	1	1	1	"	"
Mignonne and Durham .....	14	.....	1	1	1	"	"
St. Joseph and Guy .....	15	.....	1	1	1	"	"
Mountain and Sherbrooke .....	15	12 in.	1	1	1	hydrant.	" split by frost.
Britannia and St. Etienne .....	15	.....	1	1	1	spindle.	Screw of spindle worn out.
Labelle and St. Catherine .....	18	4 in.	1	1	1	valve.	" valve
Amherst and St. Catherine .....	18	4 in.	1	1	1	one	" old one
Commissioners, near St. Sulpice .....	18	.....	1	1	1	"	"
Voltigeurs and St. Mary .....	18	4 in.	1	1	1	hydrant.	Old one split by frost.
St. Catherine and Jacques-Cartier ..	19	.....	1	1	1	spindle.	Screw of spindle worn out.
William and Inspector .....	19	.....	1	1	1	hydrant.	Old one split by frost.
Mansfield and Sherbrooke .....	21	4 in.	1	1	1	valve.	Valve worn out.
Sherbrooke and Mathew .....	21	.....	1	1	1	"	Old one broken.
St. Ann near Gas House .....	24	4 in.	1	1	1	hydrant.	" sp it by frost.
Mountain and Dorchester .....	28	.....	1	1	1	piece.	Pipe split.
Durham, near St. Catherine .....	28	.....	1	1	1	valve.	Old one worn out.
Craig and Campeau .....	28	.....	1	1	1	"	"
Delisle, at Old Glass Work .....	28	.....	1	1	1	"	"
Delisle, near Fulford .....	28	.....	1	1	1	"	"
Sherbrooke and St. Mathew .....	29	.....	1	1	1	one.	Changed the hydrant
Lacroix, near Champ de Mars .....	29	.....	1	1	1	valve.	Full of stones.
Lagauchetière and Jacques-Cartier ..	30	.....	1	1	1	"	Valve worn out.
						hydrant.	Old one split by frost.

Sanguinet and St. Catherine	Aug.	30	4 in.	1	"	valve.
Vitiation near Sherbrooke.	Sept.	4	6 in.	1	"	piece.
Guy near St. Antoine.		4	6 in.	1	"	"
Wellington, near St. Anne.		5	10 in.	1	"	"
St. Andre and Miguonne.		8	.....	1	Recalked the joint.	Split pipe.
Bonaventure and Mountain.		9	16 in.	1	Put in a new spindle.	Joint blown out.
Adolphus and Craig		14	4 in.	1	piece.	Screw of spindle broken.
St. Denis at Deaf and Dumb Inst.		20	.....	1	valve.	Broken by Tunnel.
Papineau Road, N. E.		20	.....	1	"	Worn out.
Common and St. Peter		20	.....	1	"	"
Lagauchetière and Amherst.		20	.....	1	"	Old one split by frost.
Mill at McDougalls		23	.....	1	"	Old one worn out.
Bonaventure and Mountain		23	.....	1	"	"
St. Dominique and Fortier		23	.....	1	"	"
Beury and Jurors		23	.....	1	"	Rod broken.
St. Catherine and St. André.		24	.....	1	"	Valve worn out.
Craig near St. Antoine		24	6 in.	1	Recalked the joint.	Soint blown out.
Voltegeurs and Craig		28	4 in.	1	Put in a new piece.	Broken by drain.
Lagauchetière and Visitation		28	.....	1	valve.	Worn out.
Alexis and Notre-Dame		28	4 in.	1	"	Screw of spindle worn out.
Grand Trunk and Wellington		29	6 in.	1	"	"
Peel on High Level Main,		29	6 in.	1	"	Split Pipe.
Champ de Mars, near Bonsecours		29	.....	1	"	Worn out.
St. Joseph and Dupré Lane		30	.....	1	"	"
Craig and Amherst		30	6 in.	1	"	Valve broken.
Papineau and Lagauchetière.		30	6 in.	1	"	"
St. Catherine and St. Denis.		30	6 in.	1	"	"
DeSalaberry and Lagauchetière....	Oct.	7	4 in.	1	"	Broken at Tunnel.
DeSalaberry and Craig		7	4 in.	1	"	Worn out.
Blake and Papineau.		12	.....	1	"	Broken by runaway horse.
St. Catherine and Union Avenue.		12	.....	1	"	Broken—cause unknown.
St. Félix, near St. Antoine.		12	.....	1	"	Spindle worn out.
St. Joseph and Inspector		12	10 in.	1	"	"
Rousseau and Campeau		12	4 in.	1	"	"

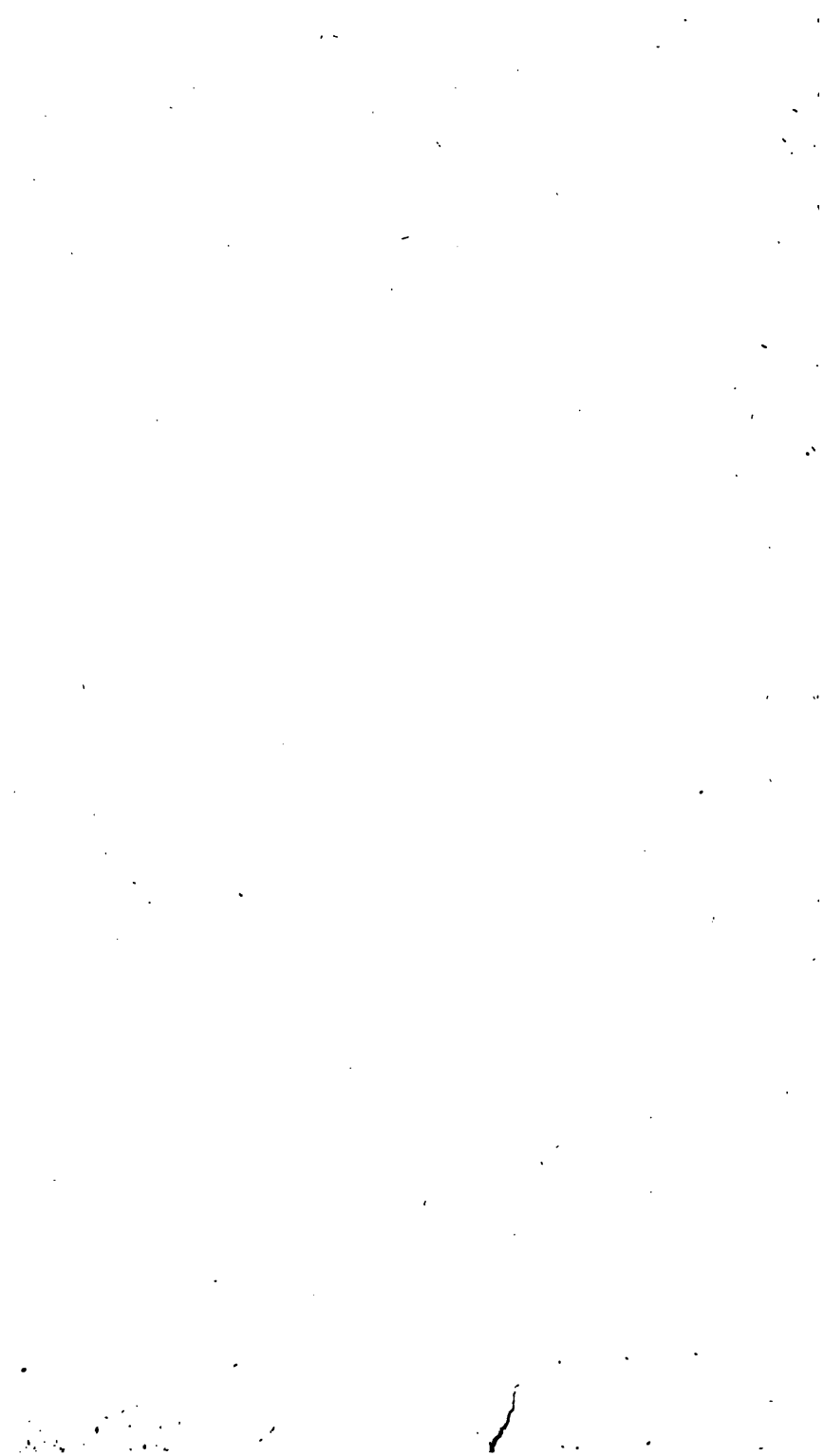
No. 8—Schedule shewing the Repairs done to Main Pipes, Hydrants and Valves, during the year 1876.

POSITION.	DATE. 1876	DIAMETER.	VALVES.				How Repaired.	Probable cause of injury.
			Valves.	Hydrants.	Breaks.	Leaks.		
Commissioners near Custom House.	Oct. 16	4 in.	..	..	1	..	Put in a new piece.	Broken, cause unknown.
Mill at Waste Weir. ....	23	10 in.	..	..	1	..	" " pipe.	Water from the Weir moved pipe.
Frontenac and Ste. Catherine. ....	28	.....	..	..	1	..	Put on a new valve.	Worn out.
Visitation and Lafontaine. ....	31	6 in.	..	..	1	..	Put in a new piece.	Broken across drain.
St. Denis and Ontario. ....	31	10 in.	..	..	1	..	Made a new joint.	Joint badly made.
Essex Avenue. ....	2	4 in.	..	..	1	..	Put in a new piece.	Broken by putting in a nozzle.
Wellington near Farm. ....	6	12 in.	..	..	1	..	Recaulked the joint.	Joint badly made.
Montcalm and Mignonne. ....	7	.....	..	..	1	..	Put on a new valve.	Valve worn out.
Ann and Wellington. ....	8	4 in.	1	..	..	..	" "	Gate of valve broken.
St. Charles Borromée and Mignonne. ....	9	4 in.	..	..	1	..	Put in a new piece.	Split pipe.
St. Hubert and St. Catherine. ....	10	4 in.	1	..	..	..	Put on a new valve.	Gate of valve broken.
Wellington and St. Etienne. ....	10	12 in.	..	..	1	..	Recaulked the joint.	Joint badly made.
St. Gabriel and St. Paul. ....	11	.....	..	..	1	..	Put in a new rod.	Rod broken.
Colborne Avenue, above Ontario. ....	15	.....	..	..	1	..	Put on a new valve.	Valve worn out.
Victoria Skating Rink. ....	16	.....	..	..	1	..	" "	" "
Shaw and Craig. ....	16	4 in.	..	..	1	..	Put in a new piece.	Broken across drain.
Monique and Cathcart. ....	24	4 in.	..	..	1	..	" "	" "
Stanley and Dorchester. ....	27	4 in.	1	..	..	..	Spindle.	Spindle too short.
St. James near St. Lambert. ....	27	10 in.	..	..	1	..	" "	Caused by sudden shutting.
St. James near Post Office. ....	27	10 in.	..	..	1	..	" "	" "
Wellington, S. S. Canal. ....	28	12 in.	..	..	2	..	Recaulked the joints.	Joints badly made.
Dorchester, near Papineau Road. ....	29	10 in.	..	..	1	..	" "	" "
St. Denis, above Roy. ....	30	6 in.	..	..	1	..	Put in a new piece.	Broken by drain.
Wellington, S. S. Canal. ....	30	12 in.	..	..	14	..	Recaulked the joints	Joints badly made.
St. Etienne and Forfar. ....	30	.....	..	..	1	..	Put in a new rod.	Broken rod.



No. 9.—SCHEDULE shewing the different kind and sizes of Water Meters belonging to the Water Works and to private parties.

KIND.	SIZE IN INCHES.	PROPERTY OF THE WATER WORKS.			Property of Private Parties.	
		In the City.	Outside of the City.	At the Work Shop.	In the City.	Outside of the City.
Gem.....	1	4	45	25	4	.....
".....	1	18	.....	16	5	.....
".....	1	9	.....	3	6	.....
".....	1 1/2	7	4	.....	4	.....
".....	1 1/2	2	1	.....	5	.....
".....	3	.....	1	.....	4	.....
".....	4	7	2	2	.....	1
".....	6	2	1	.....	.....	.....
".....	10	.....	.....	1	.....	.....
Worthington.....	5/8	2	.....	2	21	.....
".....	1	1	.....	1	.....	.....
".....	1 1/2	1	.....	.....	2	.....
".....	2	2	.....	.....	3	.....
".....	3	.....	.....	.....	.....	1
Union.....	5/8	43	93	2	8	.....
".....	1	.....	.....	.....	1	.....
".....	1	23	8	1	2	.....
".....	2	1	.....	.....	1	.....
".....	3	1	.....	.....	.....	.....
Providence.....	3/4	.....	.....	2	.....	.....
Maxim.....	1 1/2	.....	.....	1	.....	.....
Aubin.....	1 1/2	.....	.....	1	.....	.....
Desper.....	1 1/2	1	.....	.....	.....	.....
".....	1 1/2	.....	.....	1	.....	.....
Fairchild.....	3/4	.....	.....	1	.....	.....
Lewis.....	3/4	.....	.....	1	.....	.....
Total.....	.....	124	155	60	66	2



...J.—СЧЕТЫ showing the Pipes, Hydrants, Valves, Services, &c., laid down in the City of Montreal during the year 1876.

NAME OF STREETS.	LENGTH IN FEET OF CAST IRON PIPE.							NUMBER OF VALVES.						Hydrants.	Brick Chambers.	Houses Supplied.	Length of Lead Pipe in feet.	Brass Stop Cocks.
	Lead.	30"	12"	10"	6"	4"	Total.	30"	12"	10"	6"	4"	Total.					
<i>East Ward.</i>																		
Bonsecours.....						27	27									9	291	9
Champ de Mars.....																54	563	44
Notre Dame.....						218	218					3	3		3			
Gosford.....						192	192					1	1		1			
Vaudreuil.....																		
Total.....						437	437					4	4		4	63	1254	53
<i>Centre Ward.</i>																		
Normand.....																1	42	1
Notre Dame.....						414	414					2	2	1	1	20	150	15
St. François Xavier.....																1	21	1
St. James.....																1	23	1
Total.....						414	414					2	2	1	1	23	236	18
<i>West Ward.</i>																		
Fortification.....											1				1	4	94	4
St. Peter.....																1	67	1
Total.....												1			1	5	161	5





SCHEDULE shewing the Pipes, etc., laid down.—Continued

NAME OF STREETS	LENGTH IN FEET OF CAST IRON PIPE.					NUMBER OF VALVES.					Hydrants.	Brick Chambers.	Houses Supplied.	Length of Lead Pipe in feet.	Brass Stop Cocks.
	Lead.	30"	12"	10"	6"	4"	Total.	30"	12"	10"	6"	4"	Total.		
<i>St. Antoine Ward.—Cont.</i>															
Brought forward .....	160	....	9	3148	594	2074	5825			1	3	4	8	142	5336
Pea Lane.....														3	53
David Lane .....														2	21
Dorchester.....														12	444
Mountain .....														2	33
Desrivieres .....														3	58
Aqueduct .....														1	23
Victoria Square .....														1	32
Bisson .....														5	131
Richmond .....														4	190
St. Monique .....														3	42
Shuter .....														4	70
Mansfield .....														5	187
Dorchester .....														2	36
Richmond, Avenue .....	138													6	101
University .....									2				2	.....	.....
St. Catherine.....														1	69
Pine, Avenue .....			990				990							.....	.....
Dominion .....												2	.....	.....	.....
Beaver Hall, Hill .....													1	44	1
Metcalfe .....													4	80	4
Quiblier .....													1	49	1
Lorne, Avenue.....					220	55	275						14	516	14
Colborne .....													.....	.....	.....
Essex, Avenue.....						450	450				1		6	70	6
												1	9	271	9







SCHEDULE shewing the Pipes, &c.—*Continued.*

NAMES OF STREETS.	LENGTH IN FEET OF CAST IRON PIPES.							NUMBER OF VALVES					Hydrants.	Brick Chambers.	Houses supplied.	Length of Lead Pipes in feet.	Brass Stop Cocks.		
	Lead							30"	12"	10"	6"	4"						Total.	
	30"	12"	10"	6"	4"	Total.	30"	12"	10"	6"	4"	Total.							
<i>St. James Ward—Con.</i>																			
Beadry .....						32	32						1	1		5	425	5480	421
St. André .....																1	85	961	85
Ontario .....						9	9								1	1	68	844	68
Montcalm .....																	22	634	22
St. Hubert .....																	3	57	3
Berri .....																	23	799	23
Labelle .....																	10	96	8
St. Catherine .....																	19	229	19
Perthuis .....																	186	1354	73
Robin Lane .....																	1	16	1
Visitation .....																	1	11	1
Dorchester .....															1		58	229	58
Lagauchetière .....																	2	32	2
Sherbrooke .....	300						300										2	59	2
Total .....	300				41	341							1	1	2	9	905	10801	786
<i>St. Mary's Ward.</i>																			
Volteigurs .....																	20	310	15
St. Ignace .....																	30	241	19
St. Adolphe .....																	17	210	16
Shaw .....					306	306											10	155	10
Colborne Avenue .....				2	2	2						1				1	2	85	2









No. 12.—SCHEDULE shewing the Monthly Average pressure in the City Mains during the year 1876.

MONTH.	At Water Workshop Lagauche- tière street, corner of St. Charles Borromée.	Central Fire Station Craig street	Fire Stat'n. No. 2, St. Gabriel Street.	Fire Stat'n. No. 3, Wellington Street.	Fire Stat'n. No. 4, Chaboillez Square.	Fire Stat'n. No. 5, St. Cathar- ine Street	Fire Stat'n. No. 6, Ontario Street.	Fire Stat'n. No. 7, Dalhousie Square.	Fire Stat'n. No. 8, Craig Street.	Fire Stat'n. No. 9 Centre Street.
1876										
January.....	.....	69.00	49.00	75.00	65.00	47.00	62.00	.....	69.00	71.00
February.....	64.00	68.00	46.00	75.00	65.00	45.00	62.00	57.00	61.00	70.00
March.....	61.00	70.00	46.00	75.00	.....	43.00	60.00	55.00	.....	65.00
April.....	61.00	67.00	48.00	75.00	.....	45.00	60.00	57.00	65.00	67.00
May.....	62.00	69.00	52.00	75.00	.....	47.00	60.00	59.00	65.00	67.00
June.....	62.00	.....	46.00	75.00	.....	45.00	60.00	56.00	64.00	67.00
July.....	60.00	.....	47.00	75.00	.....	.....	60.00	55.00	61.00	.....
August.....	61.00	.....	46.00	75.00	.....	45.00	60.00	54.00	60.00	.....
September....	60.00	.....	46.00	75.00	.....	45.00	59.00	56.00	60.00	.....
October.....	61.00	.....	46.00	70.00	.....	40.00	60.00	54.00	64.00	.....
November.....	.....	.....	47.00	70.00	70.00	43.00	61.00	62.00	64.00	.....
December.....	.....	.....	49.00	70.00	.....	41.00	.....	61.00	63.00	.....
Average 1876.	61.33	68.60	47.33	73.75	66.66	44.18	60.36	56.90	63.82	67.83
" 1875.	59.66	66.63	45.50	75.33	63.08	40.10	50.63	53.56	66.18	66.75

## MANAGEMENT.

No. 13.—STATEMENT shewing the various details of the expenditure  
in the Montreal Water Works Department during the civic year  
1876, ending 1st January 1877.

## ADMINISTRATION.—                      \$    cts.    \$    cts.    \$    cts.

## AQUEDUCT.

Repairs to Bridges and Fences...	515.70		
Renewing Bridge at Rock Gate.	270.00		
Cleansing Ditches and Repairing			
Banks .....	73.01		
Cutting Weed .....	60.00		
Repairs to Scow and Boats.....	18.00		
Allowance for Keeper's Horse.....	100.00		
Sundries .....	23.92		
	<hr/>	1060.63	

## WHEEL HOUSE.

Repairs to Buildings.....	550.01		
Works on Ground around the			
building .....	33.84		
Supplies (including fuel for Heat-			
ing) .....	1786.90		
Repairs to Machinery.....	464.74		
Sundries .....	16.70		
	<hr/>	2852.19	

## ENGINE HOUSE.

Repairs to buildings.....	471.19		
Supplies, Oils, Tallow, &c.....	1074.44		
Wages of Men running Engines.	5894.10		
Fuel.....	14258.33		
Repairs to Machinery and Boilers.	1792.48		
	<hr/>	23490.54	

Carried forward.....

27403 36

	\$	cts.	\$	cts.	\$	cts.
Brought forward .....			27403	36		
<b>TAIL RACE.</b>						
Repairs .....	489.	99				
Keeper's Salary.....	374.	40				
				864.	39	
<b>PIPE TRACK.</b>						
Repairs (including cleaning of valves .....			403.	57		
<b>RESERVOIRS.</b>						
(McTavish) Repairs to Valve House, Dwelling and Fence..	100.	35				
(McTavish) repairs to Walls Fuel and Light.....	184.	37				
(Côteau Barron) repairs to Fence.	21.	02				
				305.	74	
<b>HYDRANTS.</b>						
Inspecting and keeping in order.			5682.	76		
<b>PUBLIC FOUNTAINS.</b>						
Repairing, Wages and material...			498.	38		
<b>DISTRIBUTION PIPES.</b>						
Repairs to Valves, Mains, Ser- vices, &c.....	6855.	29				
Thawing Pipes & Carting Water.	1762.	50				
Inspecting Services inside Houses	1708.	98				
Repairs to Streets and Footpaths.	4823.	94				
				15150.	71	
Carried forward.....					50308	91

## SHOP DEPARTMENT.

	\$	cts.	\$	cts.	\$	cts.
Amount brought forward....			50308.91			
Men's Wages, Turncocks .....	6666.34					
Iron and Timber.....	42.73					
Repairs to Buildings and Rent to Foreman's Dwelling.....	260.00					
Sundries, Coal and Wood for Fuel.....	772.19					
Instalment on Shop.....	800.00					
Tools, Spikes.....	321.27					
			8862.53			

## MISCELLANEOUS.

Staff's Salary.....	9440.00					
Superintendent's Horse Keep, Harness and Sleigh.....	600.00					
Investig. Committee Expenses ...	1277.87					
Contingencies.....	137.52					
School Rate and Assessments....	1731.05					
Map for Distribution Pipes .....	1069.53					
Damages. ....	905.66					
			15161.63			

## METER DEPARTMENT.

Meter Inspector.....	779.37					
Testing and Repairs .....	888.74					
			1668.11			

## WORK-SHOP AT WHEEL-HOUSE.

Three Mechanics .....	737.39					
Materials, Iron, Copper, Lead ...	713.62					
Fuel, Light, Sundries.....	128.90					
			1579.91			
Atwater Avenue Tunnel.....			1611.29			

## ENGINE-HOUSE AT HIGH LEVEL

## RESERVOIR.

Fuel for Engine.....	1686.45					
Supplies.....	137.89					
Wages to men running Engine ...	1245.23					
Repairs to Fence and Walls.....	33.10					
“ Machinery and Sundries.	68.52					
			3171.19			

Carried forward.....

82363 57

## LOANS.—

	\$	cts.	\$	cts.	\$	cts.
Amount brought forward ...					82363	57

## PIPE LAYING.

Cast Iron Pipes.....	22588.47	
Lead Pipes, Pig Lead and Tin..	14864.98	
Valves and Service Stones.....	1694.80	
Stop Cocks, Hydrants and special		
Castings.....	7010.56	
Brass Works.....	2333.64	
Planks for Boxes.....	1611.12	
Wages .....	42491.90	
Bricks .....	894.90	
Cement and Lime.....	254.82	
Coals .....	209.18	
Planks for Footpaths.....	176.07	
Iron for Picks and Straps .....	261.11	
Tools, &c .....	973.74	
Packing .....	260.69	
Sundries, Planks, Blasting powder	2004.73	
Press House.....	750.11	
	<hr/>	98380.82

Gates (Chanteloup).....	1000.00
New Cut, 1st section.....	158176.81
Ext. of McTavish reserv. (Whelan)	58897.15
High Level Reservoir ( " )	4932.53
Engine House for High Level	
Reservoir .....	462.94
New Boilers at Engine House ...	12450.80
30 in. Main.....	14134.48
Meters.....	2524.54
Coal Shed .....	36.00
Hydraulic Press (Chanteloup)...	1450.00

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254065.25

## INCREASE SUPPLY.

Draughtsmen's Office and Surveys

516.66

---

352962.73

---

\$435326.30

# LEAD PIPES AND OTHER LEAD.

---

40,453 lbs.  $\frac{1}{2}$  inch Lead Pipes.  
 3,481 lbs.  $\frac{5}{8}$  " "  
 47,840 lbs. 1 " "  
 85,603 lbs. Pig Lead.  
 105 lbs. Block Tin.  
 1,700 lbs. Scrap Lead.

---

59 Pieces to raise Hydrants.  
 21 Seats for hydrants.  
 49 Hydrant Covers.  
 5 " frames.  
 86 Valve covers and plugs.  
 40 Hydrant posts.  
 368 Service plates.  
 23 2 nozzle hydrants.  
 3 4 " "  
 1 American "

---

63 Brass spindles assorted.  
 91 Hydrant Washers.  
 71 " Nuts.  
 50 " Nozzles.  
 1 "Globe" valve.  
 2 "Peet" valves.

---

60 Assorted Brass Couplings for Iron Pipes.  
 17 " " Stopcocks " "

## No. 14—INVENTORY OF STOCK, JANUARY, 1877.

	30"	24"	16"	12"	10"	8"	6"	4"	3"
Cast-Iron Pipes in feet...	2096	435	225	846	450	1026	29367	26567	.....
Sleeves.....	31	43	6	15	12	32	16	10	10
Elbows.....	.....	.....	.....	8	5	.....	13	6	.....
Double Bends.....	.....	.....	.....	.....	.....	.....	7	14	.....
Caps.....	4	.....	.....	25	2	.....	13	6	.....
Plugs.....	1	5	1	31	2	12	19	.....	.....
Valves.....	1	4	2	2	8	5	23	3	4

\* 64 Lengths more or less split.

	30x40	30x30	40x24	30x24	24x24	12x10	10x10	6x6										
Fork Pipes.....	1	5	1	2	4	2	2	6	.....									
	30x24	24x16	16x11	12x10	10x8	10x6	8x6	6x4	4x3									
Taper Pipes.....	10	1	2	6	1	8	1	3	6									
Cross Branches ..	30x24	30x12	30x6	30x4	12x12	12x10	12x8	12x6	12x4	10x10	10x8	10x6	10x4	8x8	8x6	6x6	6x4	4x4
	2	3	1	1	12	6	5	4	6	5	2	5	8	1	18	10	9	4
	30x12	24x4	12x12	12x10	12x6	12x4	10x10	10x8	10x6	10x4	8x6	8x4	6x6	6x4	4x4			
Single Branches ..	6	13	10	1	4	6	3	1	7	4	1	7	20	1	1			

## BRASS WORKS.

DIAMETER.	1½"	1"	¾"	½"	1x¾"	½x¾"
Stop Cocks without Couplings.....	15	16	.....	.....	.....	.....
"    with    ".....	183	179	.....	561	.....	.....
Elbows without    ".....	16	22	.....	.....	.....	.....
"    with    ".....	148	137	1764	.....	.....	.....
Single Joints.....	335	555	264	.....	.....	.....
Three-Way Branches.....	175	.....	.....	.....	.....	143
Four    "    ".....	282	.....	.....	.....	.....	.....
American Nozils.....	39	.....	.....	.....	.....	.....
Tees.....	.....	.....	.....	.....	119	.....



No. 15.—TABLE showing the number of Assessed Dwellings, Stores, Shops, Offices, Warehouses, Manufactories, Hotels, &c., in the City of Montreal for the year 1875—1876, with the Assessed Water Rates thereon.

Number Assessed.	Tenanted.	Vacant and not supplied.	Yearly Rate.	Number Assessed.	Tenanted.	Vacant and not supplied.	Yearly Rate.
2094	1947	147	\$ 5 00	24563	23590	973	
3389	3197	192	5 75	3	3	.....	\$30 50
3585	3457	128	6 50	14	14	.....	31 25
3617	3517	100	7 25	257	244	13	32 75
2137	2074	63	8 00	5	5	.....	34 25
1725	1661	64	8 75	13	12	1	35 75
722	722	.....	9 50	72	71	1	36 50
1550	1512	38	10 25	38	38	.....	37 25
77	77	.....	11 00	1	1	.....	38 75
1056	1012	44	11 75	206	195	11	40 25
44	44	.....	12 50	5	5	.....	41 75
682	659	23	13 25	45	45	.....	44 00
192	174	18	14 00	130	123	7	47 75
585	540	45	14 75	1	1	.....	49 25
14	14	.....	15 50	9	9	.....	51 50
558	520	38	16 25	71	68	3	55 25
9	9	.....	17 00	3	3	.....	56 75
733	702	31	17 75	11	11	.....	59 00
5	5	.....	18 50	55	54	1	62 75
242	238	4	19 25	2	2	.....	64 25
1	1	.....	20 00	1	1	.....	66 50
339	333	6	20 75	1	1	.....	67 25
27	26	1	21 50	20	20	.....	70 25
188	184	4	22 25	1	1	.....	71 75
1	1	.....	23 00	37	35	2	77 75
139	135	4	23 75	3	3	.....	85 25
404	388	16	25 25	12	11	1	92 75
136	135	1	26 75	1	1	.....	107 75
87	85	2	28 25	6	6	.....	115 25
22	22	.....	29 00	2	2	.....	152 75
203	199	4	29 75	1	1	.....	462 75
24563	23590	973		25589	24576	1013	

SCHEDULE showing the number of Assessed Dwellings.—*Continued.*

STORES, SHOPS, OFFICES, &c.

Number Assessed.	Tenanted.	Vacant and not supplied.	Yearly Rates.	Number Assessed.	Tenanted.	Vacant and not supplied.	Yearly Rates.	Number Assessed.	Tenanted.	Vacant and not supplied.	Yearly Rates.
355	334	21	\$ 4 00	4178	3855	323		4812	4437	375	
437	415	22	5 00	69	55	14	30 00	10	10	....	\$98 00
880	804	76	6 00	4	4	....	31 00	6	6	....	102 00
187	168	19	7 00	12	11	1	32 00	3	3	....	110 00
307	286	21	8 00	119	109	10	34 00	5	5	....	114 00
96	93	3	9 00	2	2	....	36 00	14	13	1	122 00
561	504	57	10 00	60	52	8	38 00	3	3	....	130 00
24	22	2	11 00	2	2	....	40 00	3	3	....	134 00
206	187	19	12 00	1	1	....	41 00	4	4	....	142 00
16	14	2	13 00	102	93	9	42 00	3	3	....	146 00
285	264	21	14 00	2	2	....	44 00	13	12	1	162 00
11	11	....	15 00	18	18	....	46 00	1	1	....	186 00
69	66	3	16 00	70	67	3	50 00	3	3	....	202 00
27	26	1	17 00	2	2	....	52 00	4	4	....	242 00
268	244	24	18 00	13	12	....	54 00	2	2	....	258 00
2	2	....	19 00	17	17	....	58 00	1	1	....	262 00
26	24	2	20 00	1	1	....	59 00	2	1	1	302 00
2	2	....	21 00	1	1	....	60 00	1	1	....	322 00
206	191	15	22 00	22	20	2	62 00	1	1	....	402 00
6	6	....	23 00	28	28	....	66 00	1	1	....	482 00
13	13	....	24 00	11	11	....	70 00	1	1	....	522 00
3	3	....	25 00	24	22	2	64 00	1	1	....	562 00
178	163	15	26 00	2	2	....	78 00	1	1	....	610 00
4	4	....	27 00	45	42	3	82 00	1	1	....	698 00
8	8	....	28 00	1	1	....	86 00	1	1	....	802 00
1	1	....	29 00	7	7	....	90 00	1	....	1	842 00
4178	3855	323		4812	4437	375		4898	4519	379	

## SCHEDULE showing the number of Dwellings, &amp;c.—(Continued.)

## No. 16.—HOTELS AND TAVERNS.

Number Assessed.	Tenanted.	Yearly Rates.	Number Assessed.	Tenanted.	Yearly Rates.	Number Assessed.	Tenanted.	Yearly Rates.
73	73	\$12.00	225	225	.....	260	260	.....
51	51	17.00	8	8	\$37.00	7	7	\$82.00
74	74	22.00	10	10	42.00	1	1	102.00
13	13	27.00	13	13	52.00	2	2	122.00
14	14	32.00	4	4	62.00	1	1	182.00
225	225		260	260		271	271	

HORSES.		COWS.		STALLS.		URINALS.		WATER CLOSETS.	
No.	Rate.	No.	Rate.	No.	Rate.	No.	Rate.	No.	Rate.
2932	\$2.00	579	\$1.00	543	\$1.00	288	\$1.00	153	\$3.00
				240	2 00	113	1.50	5587	4.00
						32	15.00	28	15.00
2932		579		783		433		5768	

## SPECIAL RATES.

BAKERIES.		BEER BOTTLERS.		FOUNTAINS.		FACTORIES.		STEAM ENGINES.		Total.	SUNDRIES.	
No.	Rate.	No.	Rate.	No.	Rate.	No.	Rate.	No.	Horse Power.		No.	Rate.
8	\$5.00	17	\$5.00	16	\$5.00	5	\$10.00	1	$\frac{1}{2}$	$\frac{1}{2}$	6	\$ 4.00
1	6.00	1	8.00	1	6.00	1	14.00	1	1	1	4	5.00
1	7.00	2	10.00	2	7.50	3	15.00	1	$1\frac{1}{2}$	$1\frac{1}{2}$	1	6.00
1	9.00	1	14.00	1	8.00	2	20.00	12	2	24	2	15.00
7	10.00	1	15.00	1	9.00	1	22.50	13	3	39	1	17.00
4	12.00	1	24.00	3	10.00	2	25.00	14	4	56	2	25.00
6	15.00	1	30.00	1	12.00	1	27.00	12	5	60	2	30.00
11	20.00	1	50.00	2	15.00	3	30.00	17	6	102	1	55.00
1	21.00					3	40.00	2	7	14	1	60.00
1	25.00					1	42.00	6	8	48	1	600.00
2	30.00					2	60.00	2	9	18	1	750.00
1	35.00					1	90.00	5	10	50		
1	37.50							3	12	36		
2	40.00							2	14	28		
2	45.00							2	15	30		
2	50.00							1	16	16		
								1	18	18		
								4	20	80		
								1	25	25		
								1	30	30		
								1	40	40		
46		25		27		25		102		717	22	

## RECAPITULATION.

	Tenanted.	Vacant.	Totals.
Dwellings .....	24,576	1,013	25,589
Stores, Shops, Offices.....	4,519	379	4,898
Hotels and Taverns.....	271	.....	271
	<hr/> 29,366	<hr/> 1,392	<hr/> 30,758
Steam Engines .....			102
Special Charges on Manufactories, &c .....			145
Horse Stalls .....			783
Water Closets .....			5,768
Urinals .....			433
Horses.....			2,932
Cows .....			579

*Cash Receipts by the Water Department during the civic year,  
ending the 31st December, 1876.*

For Buildings .....	\$280,329.12
“ Water Closets.....	20,519.00
“ Urinals .....	832.00
“ Horses.....	4,970.00
“ Cows.....	511.00
“ Horse Stalls .....	845.00
“ Steam Engines.....	3,910.50
“ Permits for Hoses to Water Streets, &c.....	272.00
“ Permits for Building purposes .....	2,611.45
“ Private Fountains .....	190.00
“ Bakeries.....	728.50
“ Water supplied through meters within City limits..	22,187.51
“ “ “ outside City limits..	18,354.63
“ Factories, &c. ....	2,413.50
“ Rent of Meters inside City, \$844.45; outside City, \$519.53 .....	1,363.98
	<hr/> \$360,038.19
Job works .....	\$6,626.63
Costs .....	145.55
	<hr/> 6,772.18
(Refunded, \$1,162.51)	<hr/> \$366,810.37

















